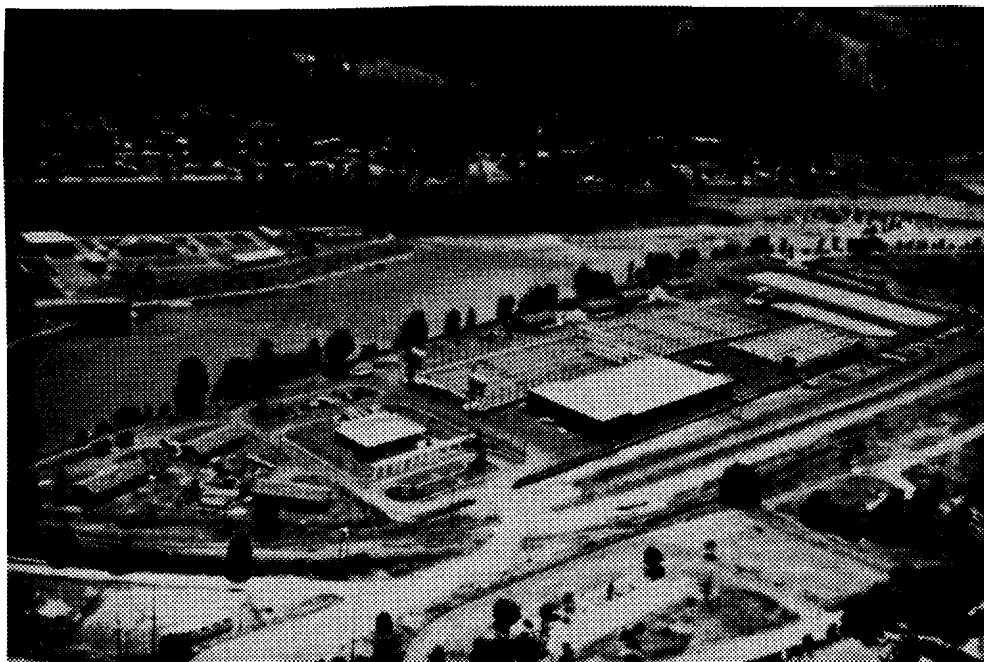




CLEARWATER FISH HATCHERY

1991 Chinook Brood Year
and
1992 Steelhead Brood Year



by

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CONTENTS

ABSTRACT

Clearwater Hatchery

As of October 1992, when our presmolts were released, Clearwater Fish Hatchery construction was completed, and the facility was staffed with seven permanent employees.

Red River

Red River weir was installed on June 10, 1991 and taken out of operation on September 15, 1991. The run total was 18 fish; 10 adult males, 7 females, and 1 jack. Four males and three females were released during the trapping season to spawn naturally, and six males, four females, and one jack were held for spawning.

Age class breakdown of this run was one jack, four 4-year-old males, six 5-year-old males, five 4-year-old females, and two 5-year-old females. Pre-spawning mortality was two fish; 18% of ponded fish. Year class information based on length frequencies of <64 cm = 3-year-olds; 64-82 cm = 4-year-olds; and >82 cm = 5-year-olds.

A total of 6,000 presmolts were released in October 1992.

Crooked River

The Crooked River weir was installed on June 10, 1991 and taken out of operation on September 24, 1991. The run total was 20 fish; 13 adult males, 5 females, and 2 jacks. Five males and one female were released during the trapping season to spawn naturally, and eight males, four females, and two jacks were ponded for later release.

There was no adult holding at this site. Ponded fish were transported 28 miles to the Red River facility. These chinook were held separate from the Red River stock. All ponded fish were held until ripe, then transported to a confined section of Relief Creek in the Crooked River drainage.

No spring chinook salmon smolts were released from 1991 broodstock. Age class breakdown of this run was two jacks, eight 4-year-old males, five 5-year-old males, and five 4-year-old females. Pre-spawning mortality was one fish; 7.1% of ponded fish. Year class information based on length frequencies of <64 cm = 3-year-olds; 64-82 cm = 4-year-olds; and >82 cm = 5-year-olds.

Powell

The Powell weir was installed on July 23, 1991 and taken out of operation on September 30, 1991. The run total was 33 fish; 21 adult males, 5 females, and 7 jacks. Thirteen males, three females, and six jacks were released during the trapping season to spawn naturally. Two males and one jack were released after ripening.

A total of 500 spring chinook presmolts were released from Powell Pond during September 1992. An additional 7,800 spring chinook presmolts were released at the headwaters to Crooked Fork. Age class breakdown of this run was seven jacks, thirteen 4-year-old males, eight 5-year-old males, three 4-year-old females, and two 5-year-old females. There were no pre-spawning mortality of ponded fish. Year class information based on length frequencies of <64 cm = 3-year-olds; 64-82 cm = 4-year-olds; and >82 cm = 5-year-olds.

INTRODUCTION

Construction responsibility for the Lower Snake River Compensation Plan (LSRCP) was assigned to the Walla Walla District Army Corps of Engineers, while responsibility for fish hatchery Operation and Maintenance funding was to be accomplished by "one of the Federal fisheries agencies." The question of Operation and Maintenance funding was settled in 1977 with the signing of an interagency agreement by the Corps, National Marine Fisheries Service (NMFS), and the Fish and Wildlife Service (FWS). It stated that the FWS would budget for and administer Operation and Maintenance funding for LSRCP fish hatchery programs (responsibility for administration and Operation and Maintenance for fish passage and wildlife programs remains with the Corps).

Public Law 99-662, approved November 17, 1986, modified the Water Resources Development Act of 1976 in accordance with recommendations contained in a report from the Chief of Engineer, dated March 6, 1985. The Chief's report confirmed the 1977 NMFS/FWS agreement on Page 2, Section 4.d; "The U.S. Fish and Wildlife Service should be designated to fund the operation and maintenance of all fish rearing facilities. Regarding ownership of property, the report noted in Section 5.3, Transfer of jurisdiction over all Compensation Plan fish hatcheries, appurtenant facilities and lands to the U.S. Fish and Wildlife Service for operation, maintenance, and replacement shall occur upon completion of construction by the Corps of Engineers." Consistent with the desires of the Administration and Congress, the Corps proposes to transfer fee titles of LSRCP fish hatcheries and satellite facilities to the FWS as they are completed and become fully operational.

The Corps estimated cost for construction of Clearwater Hatchery and three satellite facilities was to be \$43,153,000 (Joe McMichael's report December 1991).

Location

Clearwater Hatchery

Clearwater Fish Hatchery is located on the north bank of the North Fork of the Clearwater River, 1.5 miles downstream from Dworshak Dam, 72.5 miles from Lower Granite Dam, and 504 miles from the mouth of the Columbia River.

Red River

Red River satellite facility is located approximately 15 miles east of Elk City, Idaho. Approximately 186 miles upstream from Lower Granite Dam and 618 miles from the mouth of the Columbia River.

Crooked River

Crooked River satellite facility is located 20 miles downstream of Red River. The trap is located one-half mile upstream of the mouth of Crooked River, a tributary of the South Fork of the Clearwater River. The rearing ponds are ten miles upstream from the Crooked River adult trap. Crooked River is 172.5 miles from Lower Granite Dam and 604 miles from the mouth of the Columbia River.

Powell

Powell satellite facility is located 122 miles east of the Clearwater Hatchery at the head waters of the Lochsa River. Missoula, Montana is the closest town, which is 45 miles east. Powell is 192.5 miles from Lower Granite Dam and 624 miles from the mouth of the Columbia River.

Species Reared

Clearwater Hatchery

Chinook, steelhead, and rainbow trout were reared at Clearwater Hatchery this year.

Red River

A total of 6,000 spring chinook salmon, at 15.8 fish per pound, were released from Red River Pond on October 19, 1992. These fish were hatched and reared to 80/lb at Dworshak National Fish Hatchery, then transported on June 10, 1992 to Red River for final rearing.

Crooked River

No fish were reared at Crooked River.

Powell

Total of 500 spring chinook salmon, at 23/lb, were released from the Powell Pond on September 5, 1992. In addition, 7,800 were netted out of the pond and transported to the headwaters of Crooked Fork for release. These fish were hatched and reared to 80/lb at Dworshak National Fish Hatchery, then transported on June 11, 1992 to Powell for final rearing.

Synoptic History

Clearwater Hatchery

There is no history of disease at Clearwater Hatchery, as there have never been any fish on the station until this year.

Red River

There have been historic plants from Rapid River and Dworshak National Fish Hatchery. These plants were in the following life stages; fry, presmolts and smolt raised or acclimated in the rearing ponds, and eyed eggs that were buried in the spawning channel 200 yards upstream of the facility in the South Fork of Red River.

Crooked River

There have been historic plants from Dworshak Hatchery including smolts and adult out-plants.

Powell

There were historic plants from Rapid River and Dworshak Hatchery of both fry and smolts.

OBJECTIVES

Mitigation Goals

The goal of Clearwater Fish Hatchery and satellite facilities is to return 12,000 adult salmon and 14,000 adult steelhead above Lower Granite Dam.

Idaho Department of Fish and Game Objectives

The objectives of the Idaho Department of Fish and Game (IDFG) for the Clearwater Hatchery are to rear and release chinook salmon and steelhead into the upper Clearwater River drainage. The objectives for Red River, Crooked River, and Powell facilities are to rear and release chinook salmon into the Red River drainage, Crooked River drainage, and Lochsa River. Overall objectives are to reestablish fish runs into the tributaries, to enhance the wild spawning population, and increase sport and tribal fishing opportunities.

FACILITY DESCRIPTION

General Hatchery Description

Clearwater Hatchery

The Clearwater Fish Hatchery is the final facility to be built by the U.S. Army Corps of Engineers under the Lower Snake River Compensation Plan. This facility is also the largest of the hatcheries they have built.

The administration/dormitory building has 4,536 square feet. The dormitory section includes four bunk rooms with maximum capacity of 16 people, a living room, dining room, kitchen, men and women shower rooms, and a laundry room. The administration portion consists of an 25-ft x 36-ft office space with four office dividers, file cabinets, and three additional work stations. A 13-ft x 18-ft visitor reception area is the entry way to the office.

The shop area covers 1,783 square feet. There is a vehicle maintenance shop and a smaller mechanical repair shop. A screen storage room has been altered for a carpentry shop.

The hatchery room covers 24,840 square feet. This building also has an incubation room with 1,109 square feet and a walk-in freezer with 656 square feet. A screen and equipment storage building is located on the west end of the hatchery which has 1,280 square feet. There are seven residences located on the hatchery grounds, with 1,285 square feet of living space and 507 square feet of storage/garage space. Each residence also has a 14-ft x 12-ft storage building.

Two 1.8-mile long pipelines run upstream to Dworshak Dam. Both pipelines go up the face to a level of 245 feet below the top of the dam, then through the dam into the reservoir. The 18-inch pipe is stationary, with a screened inlet to keep out debris. This pipe supplies cool water to the hatchery. The 48-inch flexible plastic pipe can be raised to the surface of the reservoir and is suspended from a floating platform. A winch allows us to raise and lower this pipe to locate the desired water temperature. This pipe supplies the warm water to the hatchery. The distribution structure's purpose is to reduce the high water pressure from 286 psi of the supply lines to the gravity flow of 7 psi to the hatchery. The structure consists of a primary and secondary chamber. Each chamber has two ported sleeve valves that are used to reduce the pressure. One valve is in operation while the other is on stand-by for emergencies.

A 73,600-cubic-foot cleaning sedimentation pond is used during cleaning to settle out the settleable solids produced by the hatchery. A 414,000-cubic-foot final sedimentation pond settles waste from the total flow of hatchery operation and the out-flow of the cleaning sediment pond.

Red River

The Red River site is located on 6.29 acres. There are three structures on this facility. A 16-ft x 25-ft freezer storage building which houses a walk-in freezer, some dry storage shelves, and an area to weigh out daily feed. A 12-ft x 16-ft work shop and formalin storage building, and a 25' x 25' support cabin with kitchen, living room, 10-ft x 12-ft shop area and bunk room with four beds.

Crooked River

There are two separate sites to this facility. The first is the trap and support cabin located one-half mile upstream of the mouth of Crooked River. The support cabin is 25-ft x 25-ft with a small shop, kitchen/dining room, bathroom, and a bedroom with two bunk beds.

The weir consists of removable posts and panels that are supported by an iron bridge across Crooked River. The trap is a 9-ft x 13-ft x 4-ft deep holding container. There are no holding ponds here, all fish are either released directly from the trap or transported to the Red River holding ponds.

Ten miles upstream from the cabin are two raceways. The actual rearing space measures 145-ft x 20-ft x 4-ft deep which gives us 11,600 cubic feet. There is a cleaning waste pond and final settling pond to meet Environmental Protection Agency (EPA) water quality standards. One mile further upstream is the freezer building, which is 25-ft x 25-ft and has an indoor area for dry storage.

Powell

The Powell facility is located at the confluence of Crooked Fork and White Sands Creek which form the Lochsa River. There is one rearing pond that measures 165-ft x 65-ft x 5-ft deep. A diversion and intake screen structure are located on Walton Creek and a pump house on White Sands Creek. There are two adult ponds that measure 100-ft x 12-ft x 4-ft deep. A floating weir in the Lochsa diverts fish into Walton Creek, where another weir diverts them into the fish ladder and fish trap. An open-bay spawning shelter is at the head end of the adult ponds which provides 806 square feet of work space. Also on site is a support cabin with kitchen/dining/living room, a bathroom, and a bedroom with two sets of bunk beds. There is also a garage/shop and walk-in freezer to store fish feed.

Production Capacities by Unit

Clearwater Hatchery

The steelhead rearing facilities consist of 300-ft x 10-ft x 6-ft raceways that are supplied by a center-head raceway with an east and west bank of 12 raceways. Total rearing space of these 24 raceways is 216,000 cubic feet. This area will rear a maximum capacity of 2.4 million steelhead smolts with .3 density index (Piper). A flow of approximately 1.67 cubic feet per second (cfs) is available for each raceway. It is suspected that this flow will only allow 1.7 million steelhead to be reared in these raceways without exceeding the flow index of 1.2 (Piper). All water for these raceways flows through degassing towers, then into the head raceway. These raceways are supplied with water from the surface intake only.

Chinook Raceways are 200-ft x 10-ft x 3-ft each. These 11 raceways have a total rearing space of 77,000 cubic feet. These raceways are supplied with water from both intakes and a mixing chamber, which allows for the control of water temperature to rear chinook. The maximum rearing capacity of these raceways is 1.5 million smolts at a .3 density index.

The adult holding facility consist of two ponds with a combined capacity 8,000 cubic feet and a maximum holding capacity of 800 adult salmon. There is

also a covered spawning area with two live wells for on-site egg taking. This facility is supplied with water from the tailrace of the juvenile chinook raceways.

The incubation room contains 40 double stack Heath incubators with a total of 640 trays available for egg incubation. The upper and lower half of each stack (eight trays each) has a different water supply and drain. This design will aid in segregation of diseased eggs. The maximum capacity of this facility is 5 million green eggs. The incubation room is supplied with both water sources to provide the desired temperature for incubation.

Sixty concrete vats, measuring 40-ft x 4-ft x 3-ft, are inside the hatchery building for early rearing and contain 506 cubic feet of rearing space each. This part of the facility can rear 5.9 million fish to 287/lb at .3 density index. The vats are supplied with water from each intake. Every vat also has an incubation jar plumbed directly into them. The incubator jars have a total capacity of 2.6 million eggs.

Red River

The adult holding facility consists of two ponds with a total of 3,440 cubic feet and a trap area 12-ft x 20-ft x 5-ft deep. These ponds have a holding capacity of 350 fish. A removable tripod and panel weir blocks fish passage and diverts them into the fish ladder.

A 160-ft x 65-ft x 5-ft deep rearing pond will rear a maximum of 320,000 chinook smolts. This pond has a hypalon plastic liner with 8- to 10-inch diameter cobble stones on the inclined banks. The bottom of the pond is a bare liner which has aided in pond vacuuming. A catwalk runs the entire length of the rearing pond and holds eight Nielson feeders.

Crooked River

The two concrete raceways together have a capacity of 700,000 juvenile chinook with a density index of .29.

Powell

The rearing pond has 52,000 cubic feet of rearing space. Our normal loading is 320,000 fish, which will produce the best looking smolts and stay significantly under a .3 density index.

The adult ponds have a volume of 9,600 cubic feet and a holding capacity of 960 adult chinook.

WATER SUPPLY

Source

Clearwater Hatchery

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warm water intake is attached to a floating platform and can be adjusted from 5 feet to 40 feet below the surface. The cold water intake is stationary at about 245 feet below the top of the dam. An estimated 10 cfs will be provided by the cool water supply and 70 cfs from the warm water supply. Our cool water supply has remained constant at 40°F. The warm water can reach 80°F, but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake will be moved to the 40°F level until water temperatures rise in the spring (Appendix A.1). All water is gravity flow to the hatchery.

Red River

Red River is supplied with water by gravity flow from an intake located at the bottom of the South Fork of Red River, 225 yards upstream from the facility. Our water rights permit is for 10 cfs. During low flow in the summer, about 5 cfs is available to the hatchery. Temperatures ranged from 33°F in the fall to 74°F in early August (Appendix A.2). There were 14 days during the summer of 1991 when water temperatures reached 70°F or higher.

Crooked River

Crooked River rearing raceways are supplied by an intake 200 yards upstream of the raceways at Crooked River. Our water rights permit is for 12 cfs at the rearing facility. In late summer, only 6 cfs is available. Our water rights permit is for 10 cfs, ten miles downstream, at the trapping facility. Temperatures ranged from 68°F in mid-August to 34°F in late September (Appendix A.3). All temperatures were taken at the adult trap.

Powell

The Powell facility receives water by gravity flow from Walton Creek. The intake is located 100 yards upstream from the facility. Our water rights permit is for 7 cfs from the gravity flow system on Walton Creek and 3 cfs from the pumped supply out of White Sands Creek. Water temperatures ranged from 45.8°F to 50.2°F from the Walton Creek intake and 41°F to 65°F from the White Sands pump station (Appendix A.4). Gravity flow of 7 cfs from Walton Creek and 3 cfs from the White Sands pump station. Powell also has a pumped supply from White Sand Creek. Two 7.5-horsepower pumps supply 3 cfs of water.

Water Quality Analysis

Clearwater

The water quality analysis report (Appendix B) was done at the Idaho Department of Health and Welfare water quality laboratory in Boise. The samples were taken from the hatchery incubation supply line on December 29, 1992.

A water quality parameter of particular interest in fish culture is total alkalinity. Clearwater Hatchery's water supply has a total alkalinity (as CaCO_3) of 14 mg/l, which is very low. This may prove a stress factor for some species or stocks of fish which are not adapted to this type of chemistry.

Red River

The following water quality analysis is from one-quarter mile above the mouth of Red River.

ANALYSIS	RESULTS	DATE ANALYZED
Alkalinity	25.0	10/02/92
Arsenic	<0.005	10/06/92
Cadmium Graphite	<0.001	10/28/92
Copper	<0.01	10/05/92
Hardness	22.0	10/02/92
Lead Graphite	<0.002	10/14/92
Mercury	<0.0005	10/16/92

Crooked River

Water quality analysis for Crooked River is not available at this time.

Powell

The following is water quality analysis from two miles upstream of Powell.

ANALYSIS	RESULTS	DATE ANALYZED
Alkalinity	23.0	10/20/92
Arsenic	<0.005	10/23/92
Copper	<0.01	10/16/92
Lead Graphite	<0.002	10/15/92
Mercury	<0.0005	10/16/92
Hardness	31.0	10/20/92
Cadmium Graphite	<0.001	10/28/92

STAFFING

This year Clearwater Fish Hatchery had seven permanent staff members; Jerry McGehee (Fish Hatchery Superintendent III), Doug Burton and Brad George (Fish Hatchery Superintendents I), Dan Baker, John Rankin, and Kent Bourbon (Fish Culturists). The crew also consisted of 3 temporary technicians, 1 part-time secretary, 13 Biological Aides and laborers, and 3 YCC enrollees.

The Red River, Crooked River, and Powell facilities are manned by one temporary person each, which are supervised from the Clearwater Hatchery.

1991 BROOD YEAR CHINOOK FISH PRODUCTION

Clearwater Hatchery

Incubation

All chinook eggs from the 1991 brood year were incubated at Dworshak National Fish Hatchery.

Early Rearing Procedures

All early rearing of the 1991 brood year spring chinook was accomplished by Dworshak National Fish Hatchery.

Final Rearing Procedures

No brood year 1991 spring chinook were reared at Clearwater Fish Hatchery.

Red River

Adult Collection

The weir and trap were put into operation on June 10, 1991 and was taken out of operation on September 15, 1991. The run peaked on July 4 with four fish trapped that day. A total of ten adult males, seven females, and one jack were trapped (Appendices D.1 and D.4).

Four adult males and three females were released directly from the trap above the weir to spawn naturally. Six adult males, four females, and one jack were ponded and held for spawning. One female and one adult male died, with a pre-spawning mortality of 18% (Appendices F.1 and G.1).

Age class breakdown of this run was one jack, four 4-year-old males, six 5-year-old males, five 4-year-old females, and two 5-year-old females. Our age class breakdown was as follows: less than 25 inches (64 cm) were jacks, over 25 inches (64 cm) to 32 inches (82 cm) were four-year-olds, and 32 inches (82 cm)

and over were five-year-olds. Our breakdown is from limited historic coded-wire tag (CWT) data from Ron Lindland and Rodney Duke (Appendices C.1, C.4, and E.1).

Holding and Spawning

Ponded fish were injected with erythromycin to prevent Bacterial Kidney Disease (BKD). Fish being held for spawning were also treated three times per week with 100 ppm formalin drip for one hour. After the sorting operation started, the fish were treated with formalin four times per week. The females were checked for ripeness two days per week. Our first female became ripe on August 31. Eggs were water-hardened in a minimum 100 ppm iodophor solution. No adult fish mortalities were seen due to fungus. Some small spots of fungus did show up on some fish, and future treatments should be every day after first sort. All morts were hauled to Elk City and disposed of by Walco Sanitation.

Erythromycin injections were administered at a rate of .5 cc/10 lb of body weight. The injection mixture was 14 g of erythromycin phosphate, 84% active, and 250 ml of distilled water.

Incubation

All eggs collected from the 1991 adults were transported green to Dworshak National Fish Hatchery and incubated there.

Early Rearing Procedures

All early rearing took place at Dworshak Hatchery. Fish were transported to Red River at 80 fish/lb on June 10, 1992.

Final Rearing Procedures

The rearing pond at Red River is 160-ft x 65-ft x 5-ft deep. The rearing space is 52,000 cubic feet. This was the first rearing season for the newly-constructed rearing pond. The pond was completed in the fall of 1990 and used only for a brief acclimation period. The average flow through the pond is 3 cfs. Due to the low number of fish being held, a 35-ft x 35-ft x 5-ft deep net pen was constructed to confine the fish for feeding and monitoring.

Total mortality for the season was 54 fish. These fish were fed erythromycin-medicated feed twice. The first feeding, prior to ponding, was at Dworshak National Fish Hatchery. The second feeding was completed 21 days before being released on October 19, 1992. These fish were fed at a rate of 1.7% body weight. The growth rate ranged from .35 inches/month in October to .73 inches/month in July.

These fish were 80 fish/lb at ponding. They were fed Bio-moist feed from Bioproducts of Warrenton, Oregon. They were fed Bio-moist 2.5 mm pellets until they were 50 fish/lb, then 50/50 mix of 2.5 mm and 3.0 mm until 40 fish/lb, the 100% 3.0 mm until fish were released (Appendix J).

Fish Health

No fish health problems occurred on the Red River chinook presmolts prior to release. A pre-release inspection was completed by Doug Munson, Fisheries Pathologist. The chinook were found to be in excellent condition with scores of three to four of mesentery fat on the organosomatic test (Appendix K.1).

Diseases Encountered and Treatment

Red River chinook were treated with erythromycin-medicated feed for 21 days according to the INAD 4333 protocol. Brood chinook at Red River satellite were prophylactically injected with erythromycin according to the INAD 6430 protocol.

Pathology Report

BY	STOCK	SPECIES	LOG#	DATE	VH	VP	BK	COMMENTS
BROOD	;Red River	SC	92-346	8-25	-	-	-	VIRO 0/2
1990	Dworshak	SC	92-108	3-23	-	-	-	VIRO 0/20 BK 0/15(FAT) BK 0/20(ELISA)
1991	Red River	SC	92-288	7-23	-	-		VIRO 0/10
1991	Red River	SC	92-425	10-7			-	BK 0/1(FAT)
1991	Red River	SC	92-438	10-14	-	-	+	VIRO 0/20 BK 0/20(FAT) BK 2/2(ELISA)
BROOD	Red River	SC	92-360	8-31	-	-	+	VIRO 0/2 BK
BROOD	Red River	SC	92-370	9-3	-	-	+	VIRO 0/2 BK 2/2(ELISA)
Red River water check			92-418	9-24				Alk. 25, Ars.<.005, Cd<.01 Cu<.01, Hard. 22, Pb<.002, Hg<.0005

Disease sampling results were found to be negative for virus but positive for Bacterial Kidney Disease (BRD).

Fish Marking

All of these fish were marked at Dworshak National Fish Hatchery with a left pelvic clip. There were 951 Passive Integrated Transponder (PIT) tags in this group (Appendix I).

Fish Distribution

Six thousand spring chinook salmon were released directly from the rearing pond into Red River on October 19, 1992 as part of the Idaho Supplementation research project. These fish were 15.8 fish/lb (Appendix H).

Crooked River

Adult Collection

The weir and trap were put into operation on June 10, 1991 and taken out of operation on September 24, 1991. The run peaked on July 1 with four fish trapped. A total of 13 adult males, 5 females, and 2 jacks were trapped (Appendices D.2 and D.5).

Five adult males, one female, and no jacks were released directly from the trap above the weir to spawn naturally. Eight adult males, four females, and two jacks were ponded, held until ripe, then released in a confined section of Relief Creek in the Crooked River Drainage to spawn naturally. Mortality prior to releasing all of the fish was one adult male for a mortality rate of 7.1% (Appendices F.2 and G.2).

Age class breakdown of this run was two jacks, eight 4-year-old males, five 5-year-old males, and five 4-year-old females. Our age class breakdown was as follows: less than 25 inches (64 cm) were jacks, over 25 inches (64 cm) to 32 inches (82 cm) were four-year-olds, and 32 inches (82 cm) and over were five-year-olds. Our breakdown is from limited historic CWT data from Ron Lindland and Rodney Duke (Appendices C.2, C.5, and E.2).

Holding and Spawning

There is no adult holding at this site. Ponded fish from this facility must be transported 28 miles to the Red River facility. These adults were held separate from the Red River stock.

Ponded fish were injected with erythromycin phosphate at a rate of .5 cc/10 lbs of fish body weight to prevent BKD. Fish being held were also treated three times per week with 100 ppm formalin drip for one hour to prevent growth of fungus. After the sorting operation started, they were treated every day. One mortality was seen due to fungus. The mortality carcass was hauled to Elk City, put into a dumpster, and hauled to a landfill by Walco Sanitation of Grangeville.

No fish were spawned from the 1991 chinook returns at Crooked River.

Fish Health

Adult chinook at Crooked River satellite were prophylactically injected with erythromycin according to the INAD 6430 protocol.

Pathology Report	WILD	Crooked	CHNK	92-	9-8	-	-	-	Water	Check	VIRO
BY	STOCK	SPECIES	WILD LOC	DATE	STHD	VP	BK	PC	PH	COMMENTS	-
			#								
			WILD Canyon 3	CHNK	92-	9-8	-	-	-		
			92-	9-8	-	-	-	375b	VIRO 0/4		
			WILD 373a	Settling	CHNK	92-	9-8	FAT 0/1	-	-	
			92 Pond	9-8	-	-	-	376	VIRO 0/4		
			373 Crooked	CHNK	92-	9-16	FAT 0/1	+	-	-	
			92 R.	9-8	-	-	-	392	VIRO 0/38		
			374a						FAT 0/28		

Disease sampling results were found to be negative for virus but positive for BKD.

Powell

Adult Collection

The floating weir and trap were put into operation on July 23, 1991 and taken out of operation on September 30, 1991. Late installation of the floating weir was due to debris in spring runoff destroying the kevlar rope and capstan which pulls the weir panels out across the river during installation. A total of 21 adult males, five females and seven jacks were trapped (Appendices D.3 and D.6).

Thirteen adult males, three females, and six jacks were released directly from the trap above the weir to spawn naturally. The decision was made by the Boise fisheries office on July 24, 1991 to release 66% of the run to spawn naturally. There were no mortality of fish held in the holding ponds for a mortality rate of 0% (Appendices F.3 and G.3).

Age class breakdown of this run was seven jacks, thirteen 4-year-old males, eight 5-year-old males, three 4-year-old females, and two 5-year-old females. Our age class breakdown was as follows: less than 25 inches (64 cm) were jacks, over 25 inches (64 cm) to 32 inches (82 cm) were four-year-olds, and 32 inches (82 cm) and over were five-year-olds. Our breakdown is from limited historic CWT data from the Region 2 Fisheries Biologist (Appendices C.3, C.6, and E.3).

Holding and Spawning

Ponded fish were injected with erythromycin phosphate at a rate of .5 cc/10 lbs of fish body weight to prevent BKD. Fish being held for spawning were also treated three times per week with 100 ppm formalin drip for one hour. After the sorting and spawning operation started, they were treated every day.

Females were checked twice per week for ripeness, and both females were spawned on September 20, 1991. Two females produced 9,000 green eggs for a fecundity of 4,500 eggs/female.

Eggs were water-hardened in a minimum 100 ppm argentyne solution, drained, and transported in clean water to Kooskia National Fish hatchery for incubation. Incubation

All eggs were placed in a Heath stack incubator at Kooskia National Fish Hatchery until eye-up. Eggs were then transported to Dworshak National Fish Hatchery for picking and final incubation.

No information as to loading rates of incubators, flows, temperature units, and eyed egg numbers were supplied to us.

Early Rearing Procedures

Eggs from the two Powell females were hatched and reared separately from other stock at Dworshak National Fish Hatchery. These fish were returned to the Powell rearing pond at a size of 95 fish/lb.

Final Rearing Procedures

The rearing pond has a packed concrete enriched earth bottom covered with a layered bottom of geotextile cloth, hypalon liner, and 12 inches of 1- to 3-inch diameter washed cobble on the pond floor with 6 to 12 inches of rock on the sides. The water flows in through three 5-foot pipes and cascades into the pond with an average flow of 7 cfs. A walkway runs full length of the pond and holds eight Nielson feeders that are controlled by time clocks. Water temperatures ranged from 34°F to 60°F.

Due to the low number of fish being held, a 35-ft x 35-ft x 5-ft deep net pen was constructed to confine the fish for feeding and monitoring.

Total mortality for the season was 82 fish. These fish were fed erythromycin medicated feed twice. The first feeding was prior to ponding while at Dworshak National Fish Hatchery; the second was completed 21 days prior to release on September 5, 1992. These fish were fed at a rate of 1.7% body weight. The growth rate averaged .60 inches per month for June through August.

Powell chinook were fed Bio-moist feed from Bioproducts of Warrenton, Oregon. They were fed Bio-moist 2.5 mm pellets until they were 50 fish/lb, then a 50/50 mix of 2.5 mm and 3.0 mm until 40 fish/lb, then 100% 3.0 mm until fish were released (Appendix J).

Fish Health

No fish health problems occurred on the Powell chinook presmolts prior to release. A pre-release inspection was completed by Doug Munson, Fisheries Pathologist. The chinook were found to be in excellent condition with scores of three to four of mesentery fat on the organosomatic test (Appendix K.2).

Diseases Encountered and Treatment

Walton Creek spring chinook were treated with erythromycin medicated feed for 21 days according to the INAD 4333 protocol. Brood chinook at Powell satellite were prophylactically injected with erythromycin according to the INAD 6430 protocol.

Pathology Report

BY	STOCK	SPECIES	LOG#	DATE	VH	VP	BK	BF	BR	COMMENTS
1991	WALTON Cr	SC	92-289	7-22	-	-				VIRO 0/10
1991	WALTON Cr	SC	92-372	9-6	-	-	+			VIRO 0/10 BK 1/2
BROOD	WALTON Cr	SC	92-318	8-15	-	-	+			VIRO 0/39 BK 39/40
BROOD	WALTON Cr	SC	92-319	8-16			+			BK 10/10
BROOD	WALTON Cr	SC	92-329	8-17	-	-	+			VIRO 0/21 BK 7/21
BROOD	WALTON Cr	SC	92-335	8-20	-	-	+			VIRO 0/29 BK 17/29
BROOD	POWELL	SC	92-347	8-24	-	-	+			VIRO 0/18 BK 9/18
BROOD	WALTON Cr	SC	92-359	8-27	-	-	+			VIRO 0/9 BK 7/9
BROOD	WALTON Cr	SC	92-363	8-31	-	-	+	-	-	VIRO 0/11 BK 10/11
BROOD	WALTON Cr	SC	92-371	9-4			+			BK 2/17

Disease sampling results indicated the presence of BKD but no virus.

Fish Marking

All of the fish were marked at Dworshak National Fish Hatchery with a left pelvic clip. After release, 48 chinook were PIT-tagged after being re-trapped in a screw trap located on lower Crooked Creek (Appendix I).

Fish Distribution

Seven thousand eight hundred spring chinook salmon were caught out of the net pen with dip nets and throw nets, then transferred to the headwaters of Crooked Fork Creek and released on September 5, 1992 as part of the Idaho Supplementation research project. An additional 500 spring chinook salmon were released from the rearing pond into Walton Creek on September 5, 1992. These fish were 23 fish/lb (Appendix H).

1992 STEELHEAD BROOD YEAR FISH PRODUCTION

Clearwater Hatchery

The first fish ever to be reared at Clearwater Hatchery were Mt. Lassen strain rainbow trout, which were received as eyed eggs in January 1992 (Clearwater Hatchery 1992 Resident Report). The first anadromous fish on station were 1992 brood year B-steelhead. No chinook salmon will be reared at Clearwater Hatchery until the 1992 brood year.

Synoptic History

Brood Source

Dworshak National Fish Hatchery was the source for B-steelhead eggs in brood year 1992, and will continue until we are able to establish a spawning run at one of our satellites (probably Crooked River). Spring chinook salmon will be trapped and spawned at the Red River, Crooked River, and Powell satellites.

Disease History

There is no history, of disease at Clearwater Hatchery, as there have never been any fish on the station until this year. Dworshak Hatchery has a long history of Infectious Hematopoietic Necrosis Virus (IHNV), therefore Clearwater has accepted only steelhead eggs from IHNV-negative females and has followed a strict disinfection protocol when transporting them on the station.

Incubation

Eyed steelhead eggs were received from Dworshak Hatchery on May 6 and 8, 1992 (Appendices L.1 and L.2). The eggs from egg-takes 11 and 12 were incubated in chilled water at Dworshak in order to slow development and allow delivery of all eyed eggs at nearly the same time. A total of 397,000 eggs were received.

All eggs were placed in upwelling incubators (J.L. Eager) over vats 1 through 16 (one incubator per vat). Each incubator was loaded with approximately 25,000 eggs, and water flow through each incubator was set at 15 gallons/min. Initial water temperature was 12°C (54°F). Results of the initial pick-off showed only a 0.4% handling and transport mortality.

Early Rearing Procedures

Fry from the brood year 1992 steelhead lot were presented feed for the first time on May 24, 1992. Approximate survival from eyed egg to swim-up was 378,300 fish (95.3%). These fish were divided as evenly as possible among vats 1 through 16 (23,650 fish or 12 lbs of fish/vat). The initial density index was 0.14 and flow index was 1.03. Rearing area in the vats was extended whenever the calculated density index approached 0.3 and flows were increased to keep the flow index below 1.10. Fish were held in the hatchery vats until August 18 through 20, when they were moved to eight outside steelhead raceways (seven through ten, east and west). Average length of the fish at the end of early rearing was 77.4 mm (3.05 inches). The fish also averaged 196 fish/kg with a condition factor (k) of 1.1×10^5 (89 fish/lb; $c = 3.978 \times 10^4$).

No significant fish mortalities occurred during early rearing. There was some drop-off of cripples and "pinheads" during the first few weeks (approximately 6% in five weeks), but this decreased to about 0.4% per month in July and August.

Water temperatures for the early rearing period ranged from 11°C to 18°C (52°F to 64°F) (Appendices M.1 and M.2). Whenever the temperature exceeded 13°C (56°F) for more than two days, we attempted to cool it back down by either blending in more secondary water, or by lowering the primary intake in Dworshak

Reservoir. Gaining clearance to lower the intake requires 24-hour prior notice to the control room at the dam, so there was always some lag-time in making the adjustment. There were also times during the year when we could not get clearance to enter the log boom because the dam was spilling water.

Bioproduct's starters and Biodiet formula were used to feed this lot of fish during early rearing, with the exception of the last week before the fish were moved to final rearing, when some Oregon Moist (OP-2 and OP-4) was mixed in to extend the food on hand until a new lot was delivered. A total of 3,854 pounds of food was used at a cost of \$2,320.23. The conversion rate for this period was 1.07 pounds of feed for one pound of gain.

Final Rearing Procedures

The juvenile steelhead were moved from vats 1 through 16 to steelhead raceways 7 through 10, (east and west sections). The moves were done on the evenings of August 18, 19, and 20. The transfers were done at night to avoid stress from sudden intense sunlight. Canvas-bottom nets were used to avoid de-watering the fish, thus eliminating another stressor. The 200-gallon fish transfer tank was used for the first time. There was some difficulty driving the fork lift up the ramps onto the traveling bridge, and the limited room on the bridge made the operation more challenging. A recommendation has been made to the Corps of Engineers that the grating over the center headrace be reinforced so that it will support the forklift and tank, thus eliminating the need to use the traveling bridge. The Corps has included this in the cleanup contract plans.

The initial density indices of the 356,689 fish, 89 fish/lb, ranged from 0.06 to 0.07, and the flow indices ranged from 0.186 to 0.220. These indices were recalculated biweekly and were never allowed to exceed density index = 0.2 or flow index = 1.10.

A water leak around an air relief valve on the primary pipeline was discovered on October 7. This created an emergency situation where the primary line had to be shut off completely for repairs. The only water source to the steelhead raceways is the primary line, thus all the steelhead juveniles (plus the rainbow in steelhead raceway 12) had to be moved. We borrowed Sawtooth Hatchery's 6-inch fish pump and pipe to make the move. The steelhead were transferred on October 9 from the eight steelhead raceways to the upper sections of eight chinook raceways. After repairs were complete, the rainbow were transferred back to the steelhead raceways, leaving the lower chinook raceway sections for the steelhead as they outgrew the capacity of the upper sections. Steelhead juveniles were extended into the lower sections on January 27, 1993.

No significant mortalities occurred during the final rearing period (Appendix N). One small jump occurred at ad-marking time (September 29 through October 5) when 1,321 fish were lost (0.4%). These losses included many physically deformed individuals which were intentionally culled.

The only actual inventory of these fish came at ad-marking time (September 29 through October 5). Actual numbers were found to be 5.7% short of original estimates, which went back to the original egg counts.

Water temperatures during the final rearing period were extremely variable (Appendices M.1 and M.2). The temperatures peaked in late September and early October, when the fish were still in the steelhead raceways and wholly dependent on the primary water line. The primary intake water temperatures were 15°C - 17°C (59°F - 62°F). After moving the fish to the chinook raceways, cooler water from the secondary pipeline was blended in to maintain optimum temperature until the surface water in Dworshak Reservoir cooled. The entire reservoir (and thus the

hatchery water) began to drop in temperature in late October and bottomed in mid-January at 22°C (40°F - 41°F). Temperatures began to slowly increase in late March and had reached 7°C (44°F) by April 14 when all the steelhead smolts had been stocked out.

Rangen's Salmon Grower was the diet used during the final rearing period, with the exception of a small amount of Biodiet Biodry and OP-2 (885 and 168 pounds, respectively) used immediately after the fish were moved outside. A total of 61,037 pounds of fish food was used during final rearing to produce 31,635 pounds of gain. The food-to-fish conversion rate was 1.93:1. The cost of this feed was \$16,785.11. Total feed used in early and final rearing was 64,891 pounds at a cost of \$19,108.34 (conversion rate 1.85:1; feed cost/lb of fish equaled \$0.55) (Appendix O).

Growth rates were effected by the varying water temperatures (Appendix P). The fish were intentionally fed an excess of feed during the coldest periods to insure that maximum possible growth was achieved. Care was taken to adjust the feed rate daily in order to avoid compromising fish health by having too much waste food in the raceways. Raceways were cleaned daily to help keep organic loads down.

Floating shade and hiding structures were used on two of the three CWT raceways (chinook raceways 9 and 10; raceway 9 CWT #102,947, and raceway 10 CWT# 104,938). Raceway 9 had 20% of the raceway shaded while 10 had 40%. The shade structure consisted of a PVC frame 8-ft x 6-ft, with only the 8-ft sections in the water to help minimize algae and fungus growth. The centers are at a 45° angle, and across the top is plastic fencing material that provides 80% shade.

Initially the fish did not utilize the structures for shade or hiding. They would all swim to one end of the pond or the other, away from movement. As the fish neared smolt stage, they began to utilize the structures more. They would hide under the structure when overhead movement (feeding and cleaning) occurred, unlike the fish in the non-shaded raceways. They still would all swim to one end of the raceway or the other, away from overhead movement. At release there did not seem to be any noticeable difference in fish health between the shaded and non-shaded raceways.

Fish Health

No serious disease problems were encountered at the Clearwater Hatchery in the Dworshak B-steelhead raised at the main facility (Appendix Q).

Other Assessments

Anadromous fish at Clearwater Hatchery were released in apparent normal conditions and most measurable parameters verified that premise. The Dworshak B-steelhead that were released from the Clearwater Hatchery, and later trapped near Lewiston, Idaho, were showing cataracts in one or both eyes (prevalence appeared to be from 33-75%). This problem was traced back to high total gas pressure at the transport watering station. Efforts have already been made to manage around and eventually correct this problem. The long-term effects of this event is not known. Clearwater Hatchery has implemented a stringent protocol of sanitation. This was modeled after the Big Lake Hatchery protocol and, to date, has been effective in limiting entry of any etiologic agent into Clearwater Hatchery's fish while being reared at this facility.

Pathology Report

BY	STOCK	SPECIES	LOG #	DATE	VH	VP	BK	BF	BR	BC	PW	PC	COMMENTS
1992	DWOR	STB	92-287	7-21	-	-		-	-	-			VIRO 0/10
1992	DWOR	STB	92-496	12-16	-	-	-						VIRO 0/10

Disease sampling indicated no virus or bacterial agents present.

Fish Marking

Steelhead ad-clip marking began on September 29, 1992 and ended on October 5, with a total of 336,160 fish marked, 45 fish/lb, and a mortality of .4%. Coded-wire tagging and PIT-tagging began on January 19, 1993 and ended on January 22, 1993. A total of 69,323 fish received coded-wire tags, which were separated into three different groups, and 300 fish received PIT tags (100 from each of the three groups) (Appendix R). Raceway shade structures were used in two of the three CWT raceways (raceway 9, tag #102,947; and raceway 10, tag #104,938).

Fish Distribution

On April 12 through 14, 1993, 326,300 Dworshak B-steelhead smolts (9.3/lb) were released at milepost 18 on the South Fork of the Clearwater River (above Stites). There was no hauling mortality or dead fish at the release site (Appendix S).

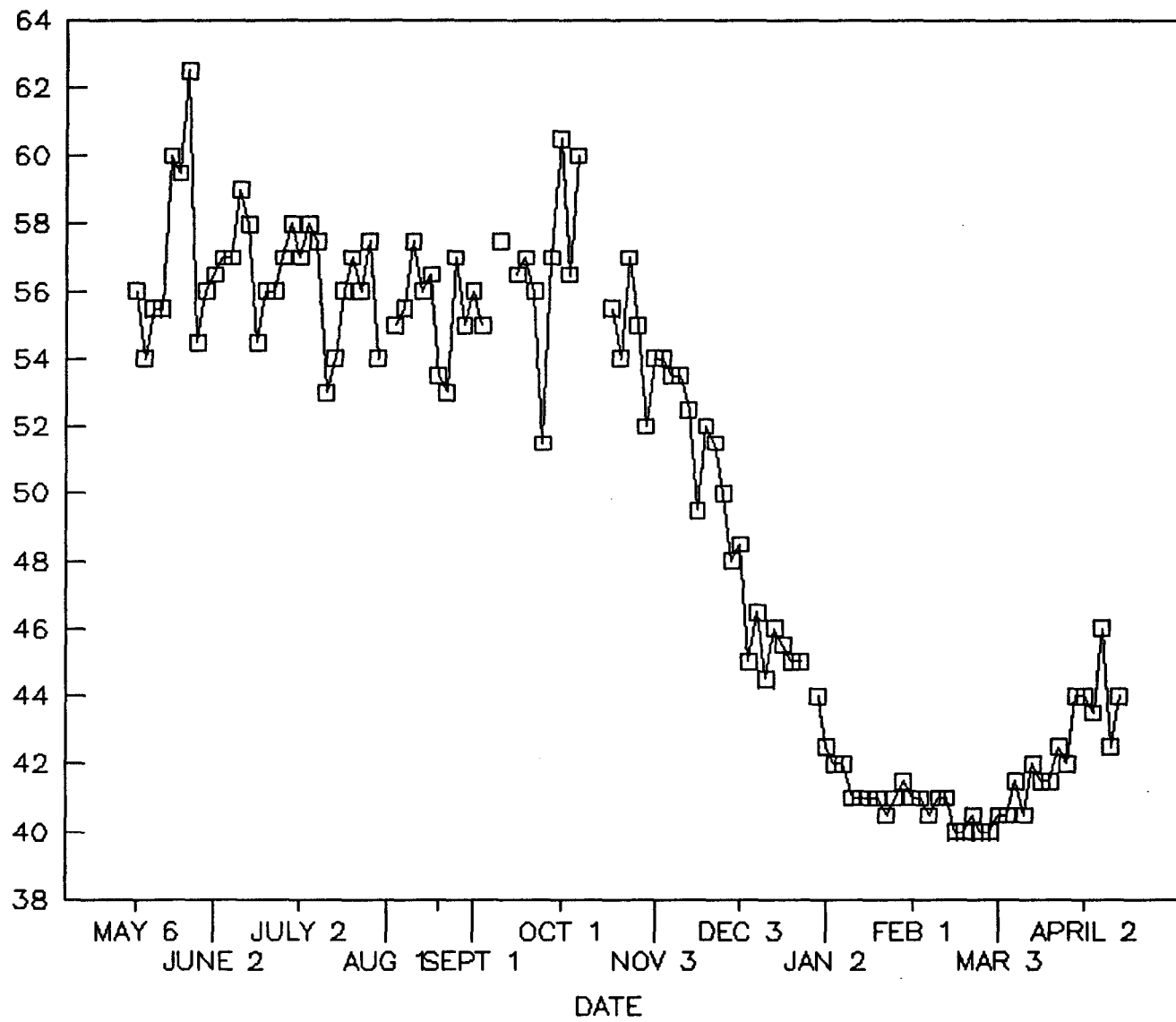
CONCLUSIONS AND RECOMMENDATIONS

Despite some major set-backs due to design deficiencies of the new hatchery and the primary pipeline breaking, the Clearwater Hatchery crew was able to raise an excellent quality steelhead smolt. Although the fish quality was excellent, there are a couple changes that need to be made in the future. First, to modify the truck water-up station with de-gassing capabilities to correct the total gas problem we had; and secondly, make the change-over from semi-moist feed to dry feed a more gradual process. A variety of clean-up contract items are scheduled to be completed in 1994 and 1995. Another rearing cycle will be necessary to identify additional spawning, incubation, and rearing deficiencies.

A P P E N D I C E S

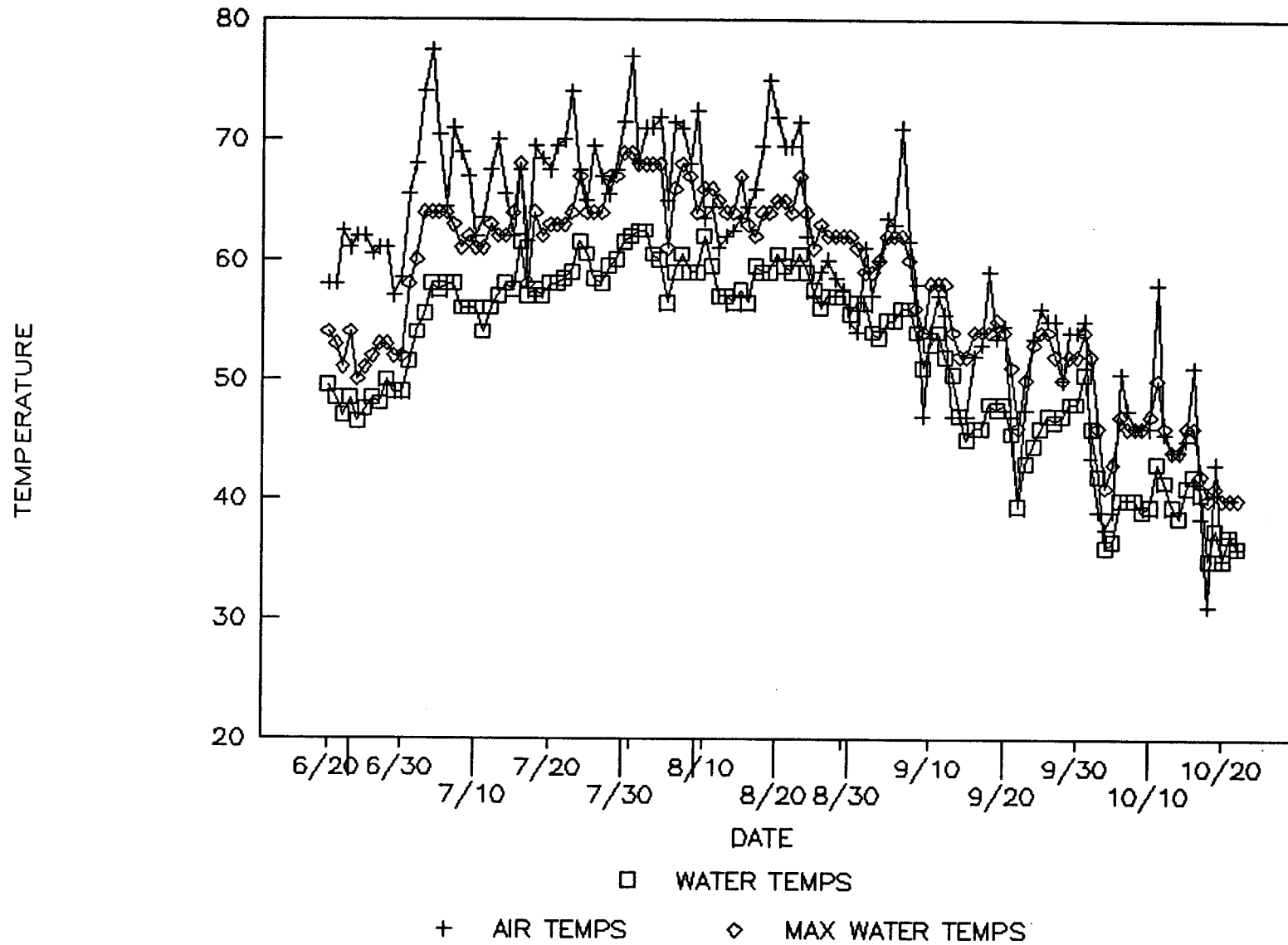
CLEARWATER HATCHERY -- BY-92

MEAN DAILY WATER TEMPERATURES



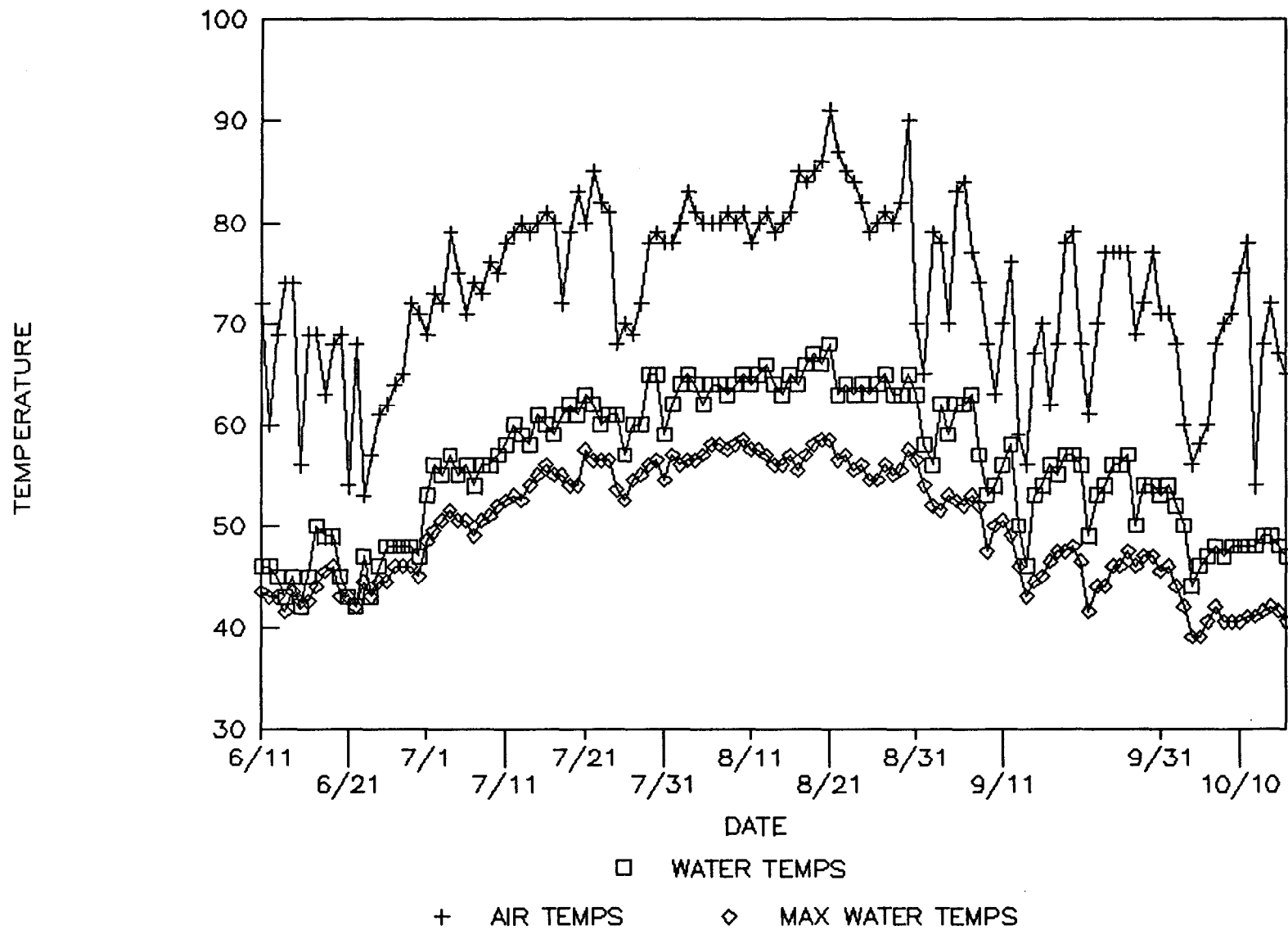
RED RIVER AIR AND WATER TEMPERATURES

BROOD YEAR 1991



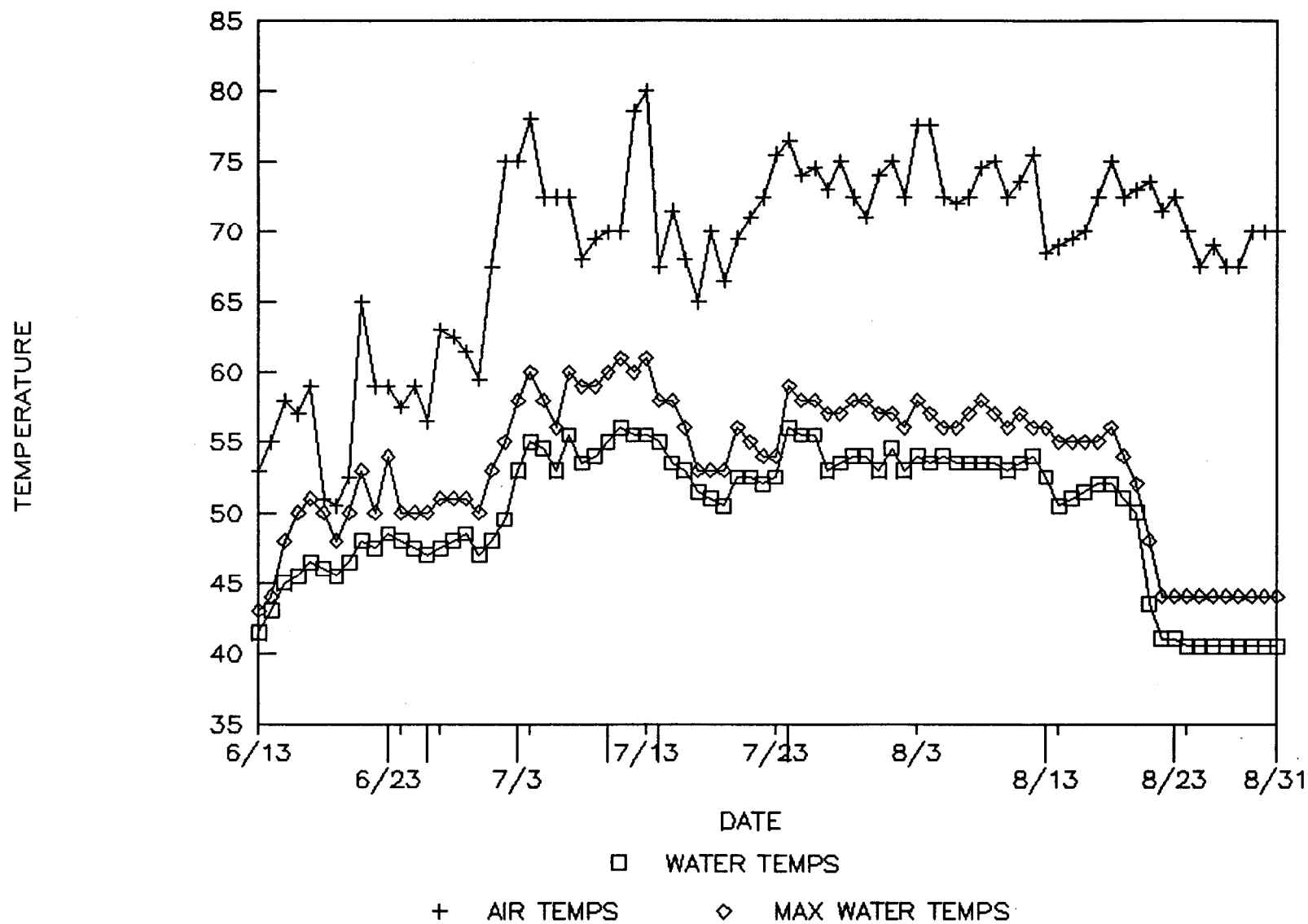
CROOKED RIVER AIR AND WATER TEMPERATURE

BROOD YEAR 1991



POWELL TRAP WATER AND AIR TEMPERATURES

BROOD YEAR 1991

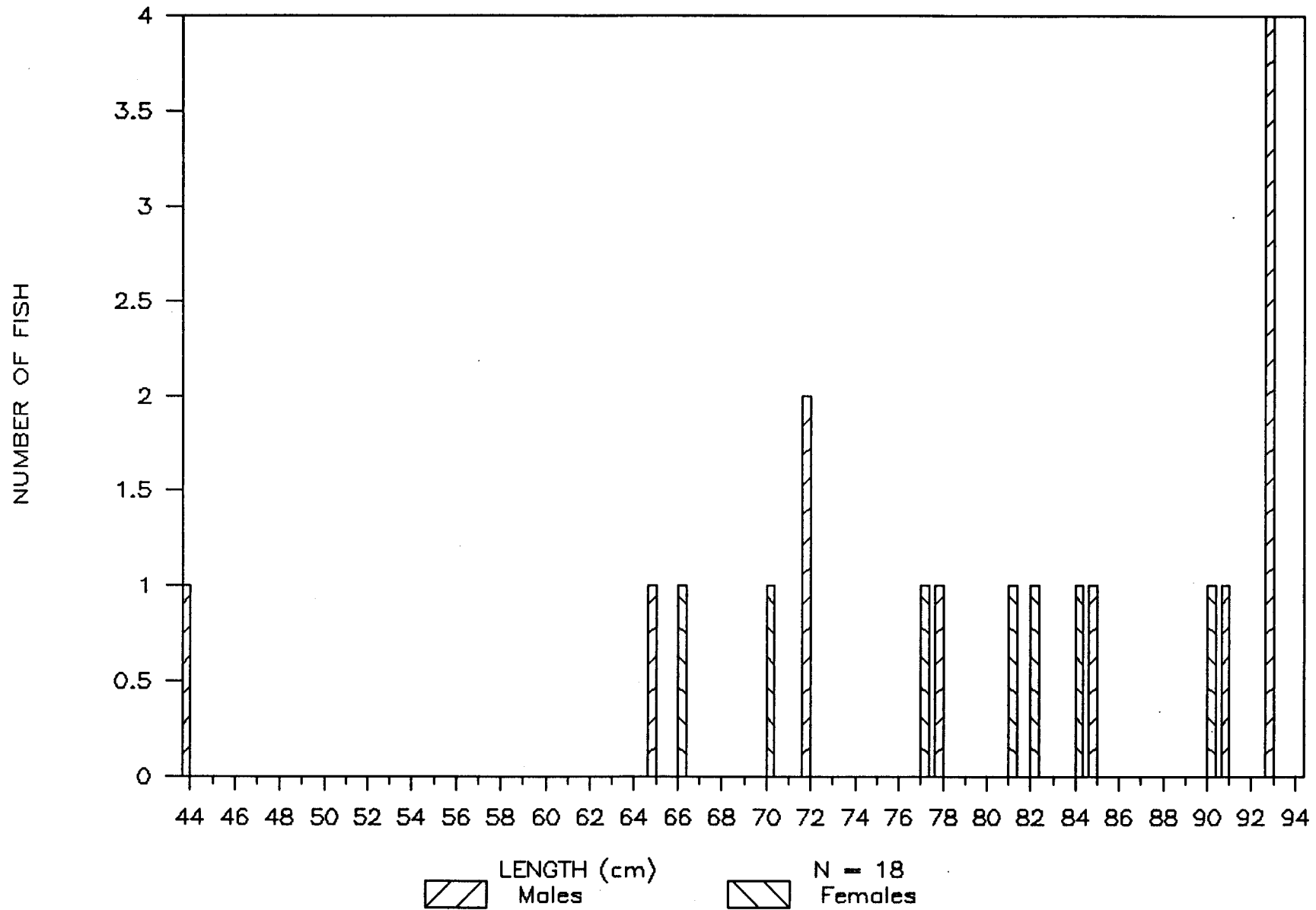


Appendix B. Water quality analysis for Clearwater Fish Hatchery,
December 29, 1992.

Test performed	Results	Measurement
Alkalinity (Total as CaCO ₃)	14	(mg/l)
Ammonia	0.022	(mg/l)
Arsenic	<0.01	(mg/l)
Barium	<0.1	(mg/l)
Cadmium	<0.001	(mg/l)
Calcium	3.7	(mg/l)
Chloride	2	(mg/l)
Chromium	0.01	(mg/l)
Color (C.U.)	5	(mg/l)
Copper	<0.01	(mg/l)
Corrosivity*	-0.76	
Cyanide	<0.005	(mg/l)
Detergents (Surfactants)	<0.08	(mg/l)
Fluoride, colorimetric, distillation	<0.01	(mg/l)
Hardness (as CaCO ₃)	12	(mg/l)
Hydrogen Sulfide	<0.005	(mg/l)
Iron	0.03	(mg/l)
Lead	<0.005	(mg/l)
Magnesium	0.7	(mg/l)
Manganese	<0.01	(mg/l)
Mercury	<0.0005	(mg/l)
Nitrogen Nitrate (Automated)	0.026	(mg/l)
Potassium	0.7	(mg/l)
Selenium	<0.005	(mg/l)
Silica	11	(mg/l)
Silver	<0.001	(mg/l)
Sodium	1.8	(mg/l)
Sulfate	<1	(mg/l)
Total Dissolved	27	(mg/l)
Zinc	0.002	(mg/l)
pH (pH units)	7.2	

SPRING CHINOOK SALMON LENGTH FREQUENCY

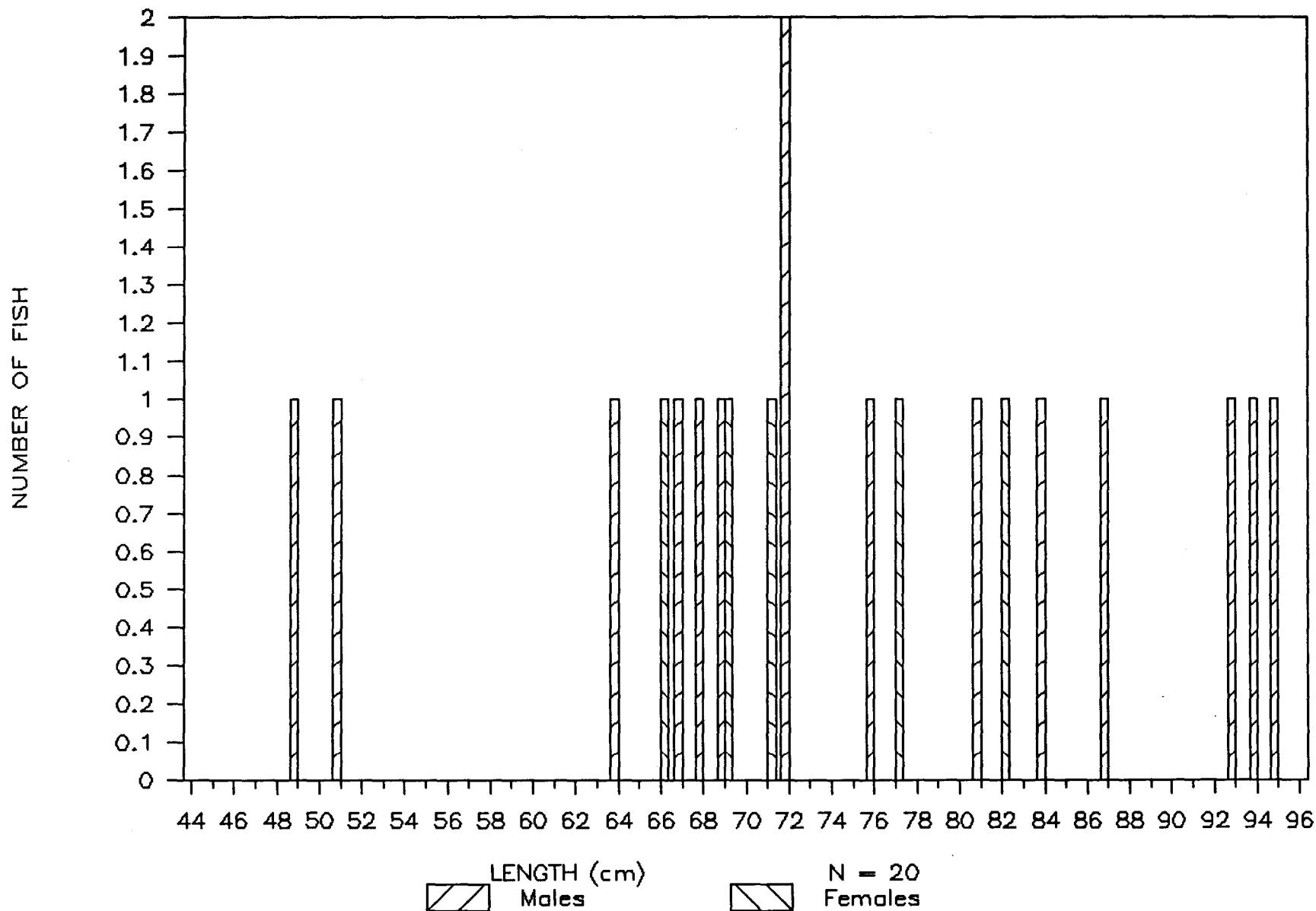
RED RIVER 1991



Appendix C.1. Red River chinook length frequencies.

SPRING CHINOOK SALMON LENGTH FREQUENCY

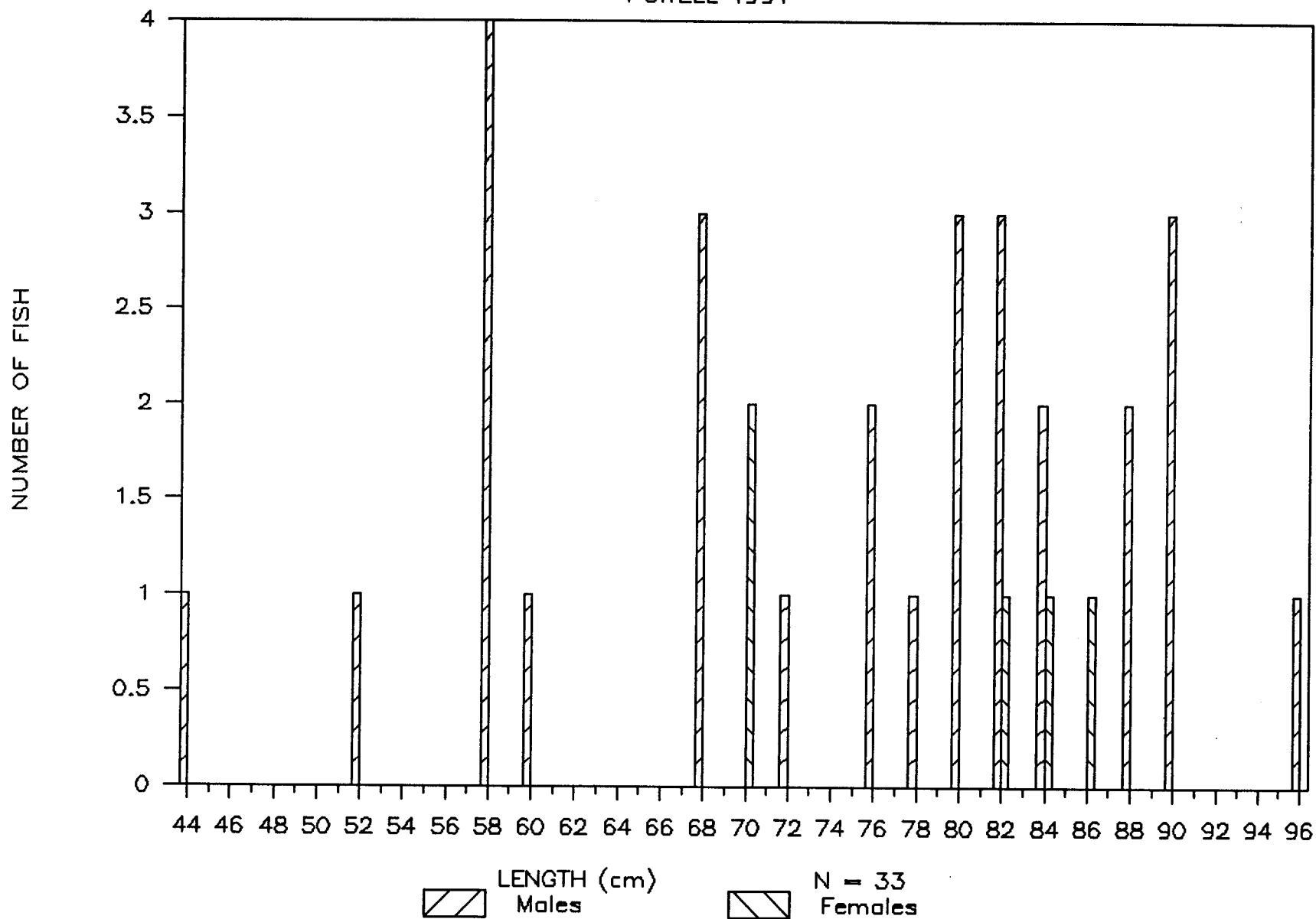
CROOKED RIVER 1991



Appendix C.2. Crooked River chinook length frequencies.

SPRING CHINOOK SALMON LENGTH FREQUENCY

POWELL 1991



Appendix C.4. Length frequency distribution of Red River, 1991.

Length (cm)	Males	Females	Fish trapped	Length (in)
44	1		1	17
46				18
48				19
50				20
52				20
54				20
56				22
58				23
60				24
62				24
64	1		1	25
66		1	1	26
68	2		2	27
70		1	1	28
72				28
74				29
76		1	1	30
78	1		1	31
80		1	1	31
82		1	1	32
84		1	1	33
86	1		1	34
88				35
90	1	1	2	35
92			0	36
94	4		4	37
TOTAL	11	7	18	

Appendix C.5. Length frequency distribution of Crooked River, 1991.

Length (cm)	Males	Females	Fish trapped	Length (in)
44				17
46				18
48	1		1	19
50				20
52	1		1	20
54				21
56				22
58				23
60				24
62				24
64	1		1	25
66	1	1	2	26
68	2		2	27
70		2	2	28
72	2		2	28
74				29
76	1		1	30
78				31
80	1		1	31
82		1	1	32
84	1		1	33
86	1		1	34
88				35
90	1	1	2	35
92	1		1	36
94	1		1	37
TOTALS	15	5	20	

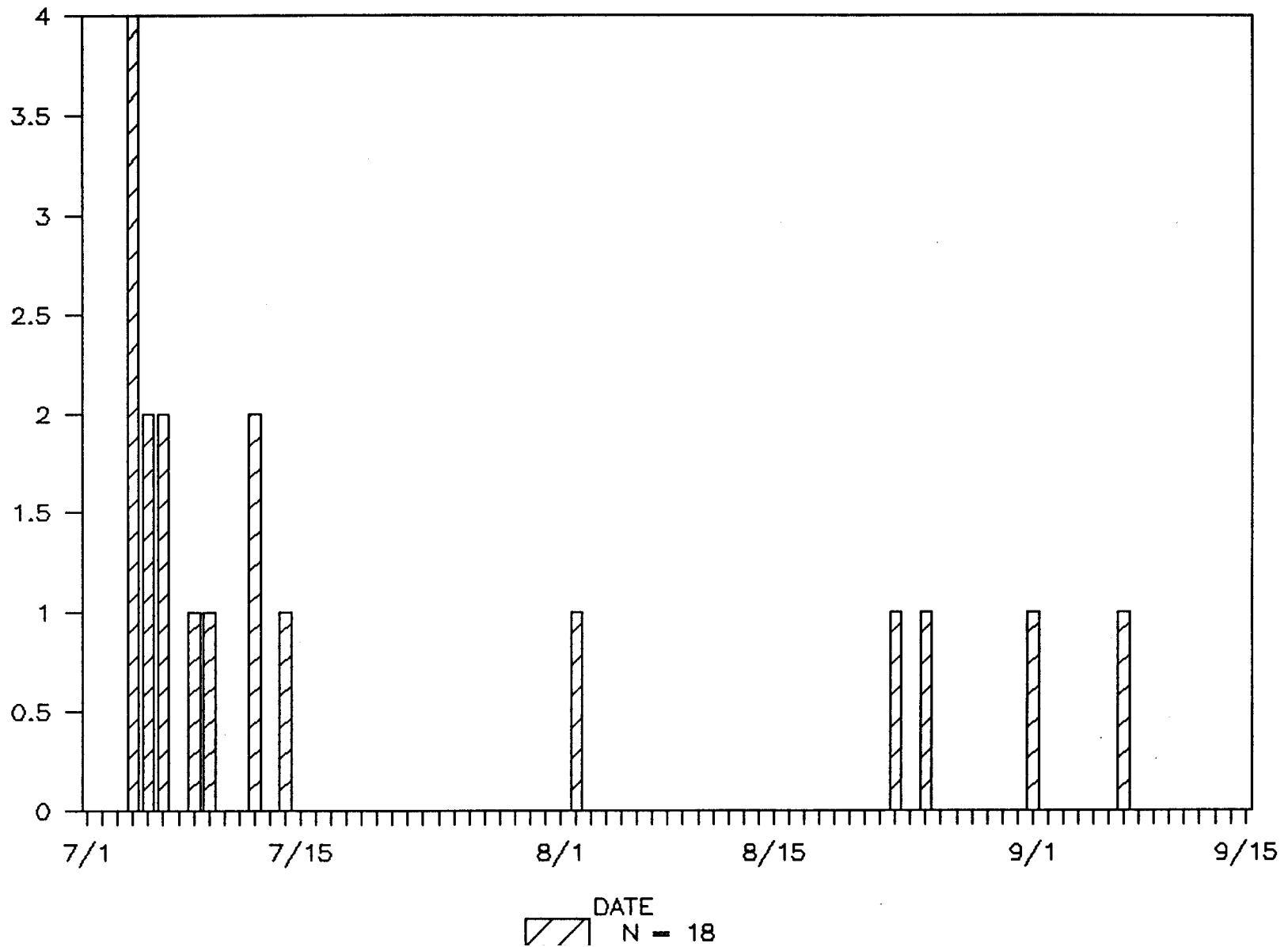
Appendix C.6. Length frequency distribution of Powell Trap, 1991.

Length (cm)	Males	Females	Fish trapped	Length (in)
44	1		1	17
46				18
48				19
50				20
52	1		1	20
54				21
56				22
58	4		4	23
60				24
62	1		1	24
64				25
66				26
68	3		3	27
70		2	2	28
72	1		1	28
74				29
76	2		2	30
78	1		1	31
80	3		3	31
82	3	1	4	32
84	2	1	3	33
86		1	1	34
88	2		2	35
90	3		3	35
92				36
94				37
96	1		1	
TOTALS	28	5	33	

SPRING CHINOOK SALMON RUN TIMING

RED RIVER 1991

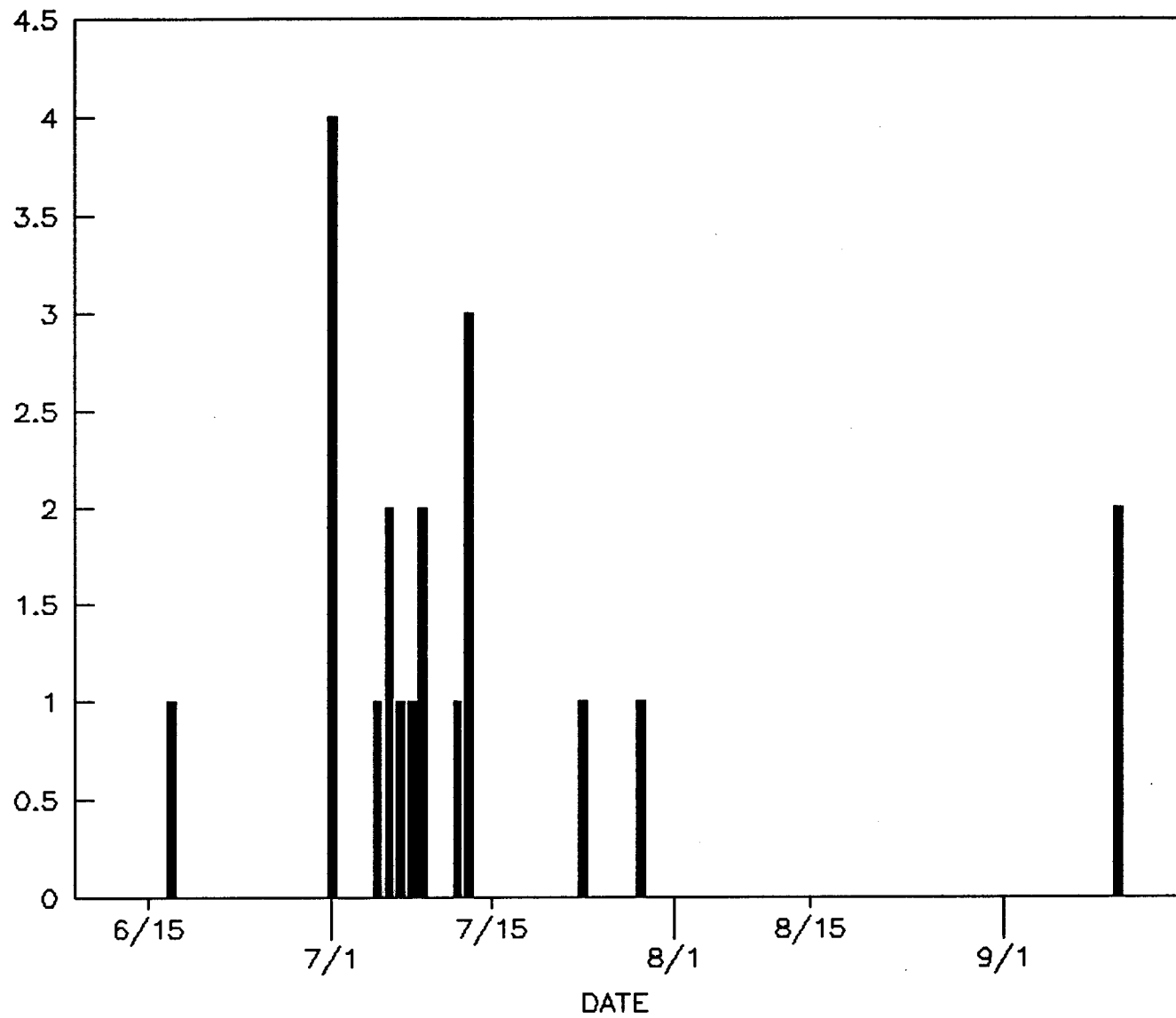
NUMBER OF FISH



Appendix D.1. Red River run timing, brood year 1991.

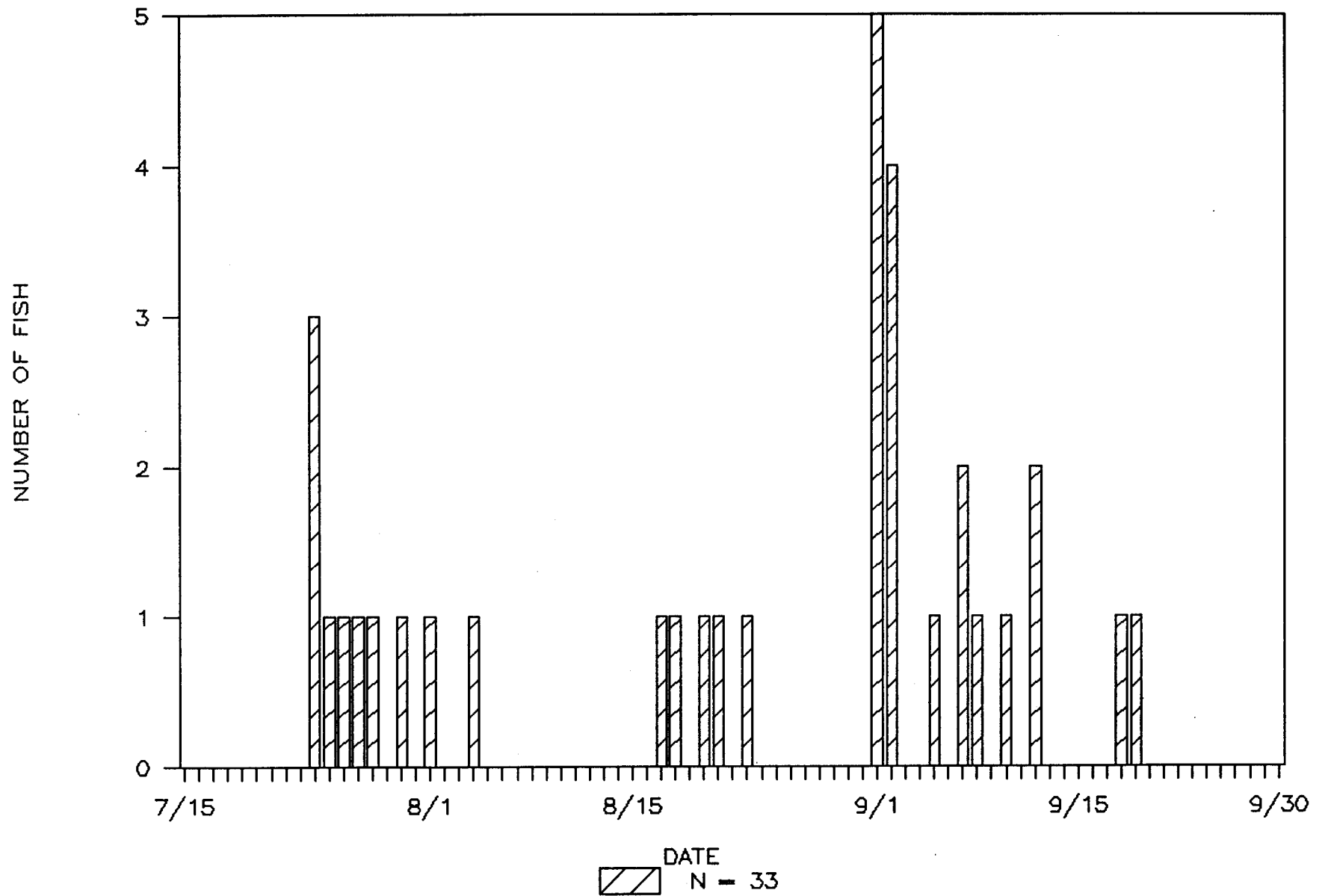
SPRING CHINOOK SALMON RUN TIMING

CROOKED RIVER BROOD YEAR 1991



SPRING CHINOOK SALMON RUN TIMING

POWELL 1991



Appendix D.4. Run timing, Red River 1991.

<u>Date</u>	<u>Number of Fish</u>
7/1	
7/2	
7/3	
7/4	4
7/5	2
7/6	2
7/7	
7/8	
7/9	
7/10	
7/11	
7/12	2
7/13	
7/14	
7/15	
7/16	
7/17	
7/18	
7/19	
7/20	
7/21	
7/22	
7/23	
7/24	
7/25	
7/26	
7/27	
7/28	
7/29	
7/30	
7/31	
8/1	
8/2	
8/3	
8/4	
8/5	
8/6	
8/7	
8/8	
8/9	
8/10	
8/11	
8/12	
8/13	
8/14	
8/15	
8/16	
8/17	
8/18	
8/19	
8/20	
8/21	

Appendix D.4. Continued.

<u>Date</u>	<u>Number of Fish</u>
8/22	
8/23	1
8/24	
8/25	1
8/26	
8/27	
8/28	
8/29	
8/30	
8/31	
9/1	1
9/2	
9/3	
9/4	
9/5	
9/6	
9/7	1
TOTAL	18

Appendix D.5. Run timing, Crooked River 1991.

Date	Number of Fish
6/15	
6/16	
6/17	1
6/18	
6/19	
6/20	
6/21	
6/22	
6/23	
6/24	
6/25	
6/26	
6/27	
6/28	
6/29	
6/30	
7/1	4
7/2	
7/3	
7/4	
7/5	1
7/6	2
7/7	1
7/8	1
7/9	2
7/10	
7/11	
7/12	1
7/13	3
7/14	
7/15	
7/16	
7/17	
7/18	
7/19	
7/20	
7/21	
7/22	
7/23	1
7/24	
7/25	
7/26	
7/27	
7/28	1
7/29	
7/30	
7/31	
8/1	
8/2	
8/3	
8/4	
8/5	

Appendix D.5. Continued.

Date	<u>Number of Fish</u>
8/6	
8/7	
8/8	
8/9	
8/10	
8/11	
8/12	
8/13	
8/14	
8/15	
8/16	
8/17	
8/18	
8/19	
8/20	
8/21	
8/22	
8/23	
8/24	
8/25	
8/26	
8/27	
8/28	
8/29	
8/30	
8/31	
9/1	
9/2	
9/3	
9/4	
9/5	
9/6	
9/7	
9/8	
9/9	
9/10	
9/11	2
TOTAL	20

Appendix D.6. Run timing, Powell trap 1991.

<u>Date</u>	<u>Number of Fish</u>
7/24	3
7/25	1
7/26	1
7/27	1
7/28	1
7/29	
7/30	1
7/31	
8/1	1
8/2	
8/3	
8/4	1
8/5	
8/6	
8/7	
8/8	
8/9	
8/10	
8/11	
8/12	
8/13	
8/14	
8/15	
8/16	
8/17	1
8/18	1
8/19	
8/20	1
8/21	1
8/22	
8/23	1
8/24	
8/25	
8/26	
8/27	
8/28	
8/29	
8/30	
8/31	
9/1	5
9/2	4
9/3	
9/4	
9/5	1
9/6	
9/7	2
9/8	1
9/9	

Appendix D.6. Continued.

Date	Number of Fish
9/10	1
9/119/12	2
9/13	
9/14	
9/15	
9/16	
9/17	
9/18	1
9/19	1

Appendix E.1. Red River summary of fish trapped, released, spawned, and disposition of carcasses.

TOTAL FISH TRAPPED: 18

AGE CLASSES	FEMALES	MALES
3 years	0	1
4 years	3	4
5 years	2	6

FISH DISPOSITION FEMALES:

Spawned:	3
Released:	3
Mortality:	1
Total:	7

FISH DISPOSITION MALES:

Spawned:	6	Adults
Released:	4	
Mortality:	1	
Total:	11	

All mortality carcasses were disposed of by Walco Sanitation of Grangeville.

3 years = <64 cm
 4 years = 64-82 cm
 5 years = >82 cm

EGG TAKES AND EYE UP

SPAWN DATE	GREEN EGG EST.	EYED EGGS	% EYE-UP	FEMALE
8/31	3,800	2,178	57.3	1
9/10	3,800	0	0.0	1
9/12	7,600	5,917	77.8	1

Appendix E.2. Crooked River summary of fish trapped, released, spawned, and disposition of carcasses.

TOTAL FISH TRAPPED: 20

AGE CLASSES	FEMALES	MALES
3 years	0	2
4 years	5	8
5 years	0	5

FISH DISPOSITION FEMALES:

Spawned:	0
Released:	5
Mortality:	0
Total:	5

FISH DISPOSITION MALES:

Spawned:	0
Released:	*12
Mortality	1
Total:	15

*12 adults, 2 jacks, 14 total

All mortality carcasses were disposed of by Walco Sanitation of Grangeville.

3 years = <64 cm
4 years = 64-82 cm
5 years = >82 cm

Appendix E.3. Powell summary of fish trapped, released, spawned, and disposition of carcasses.

TOTAL FISH TRAPPED: 33

AGE CLASSES	FEMALES	MALES
3 years	0	7
4 years	3	13
5 years	2	8

FISH DISPOSITION FEMALES:

Spawned:	2
Released:	3
Mortality:	0
Total:	5

FISH DISPOSITION MALES:

Spawned:	2
Released:	*13
Mortality:	7
Total:	28

*13 adults, 6 jacks, 19 total

All mortality carcasses were disposed of by Walco Sanitation of Grangeville.

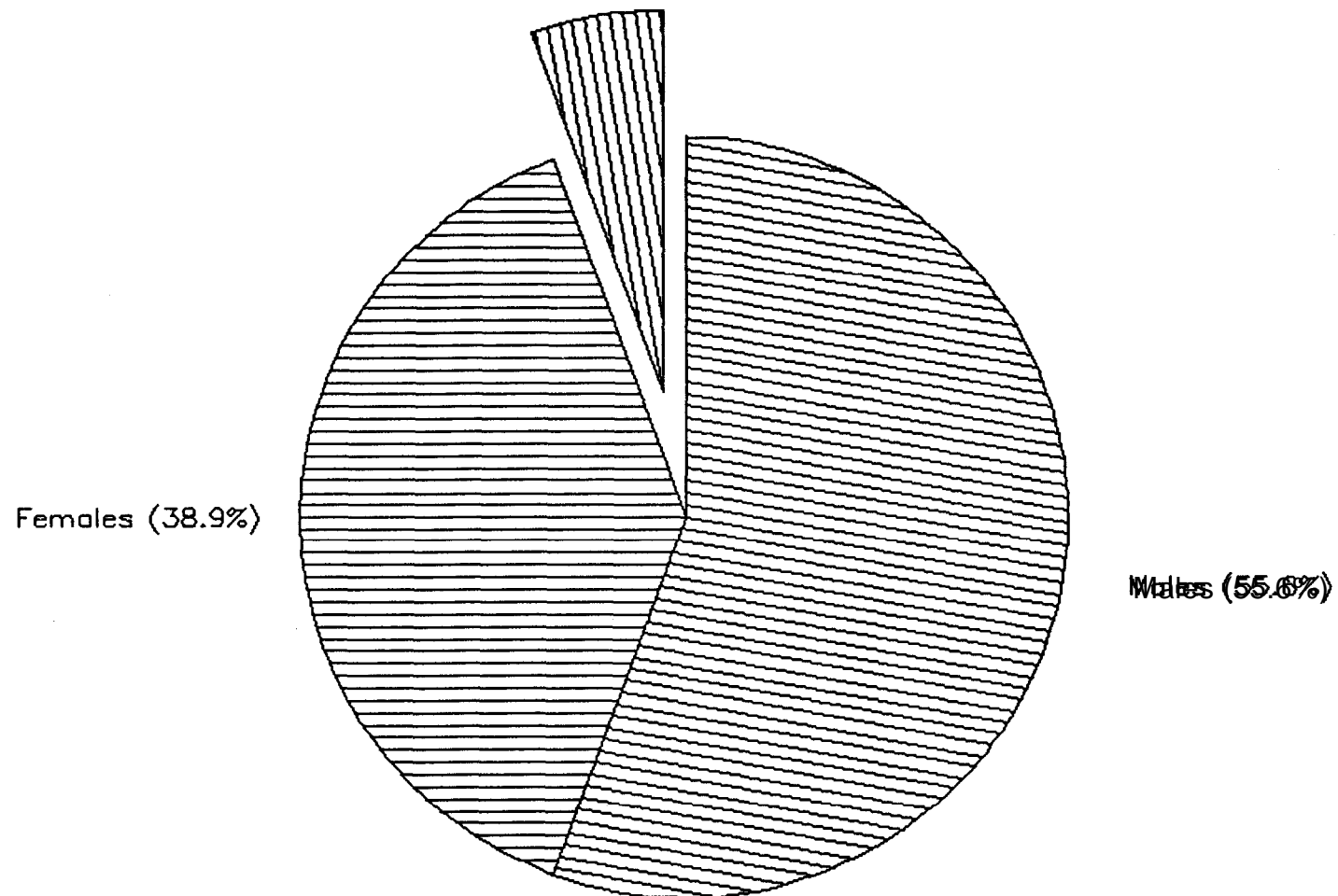
3 years = <64 cm
 4 years = 64-82 cm
 5 years = >82 cm

EGG TAKES AND EYE UP

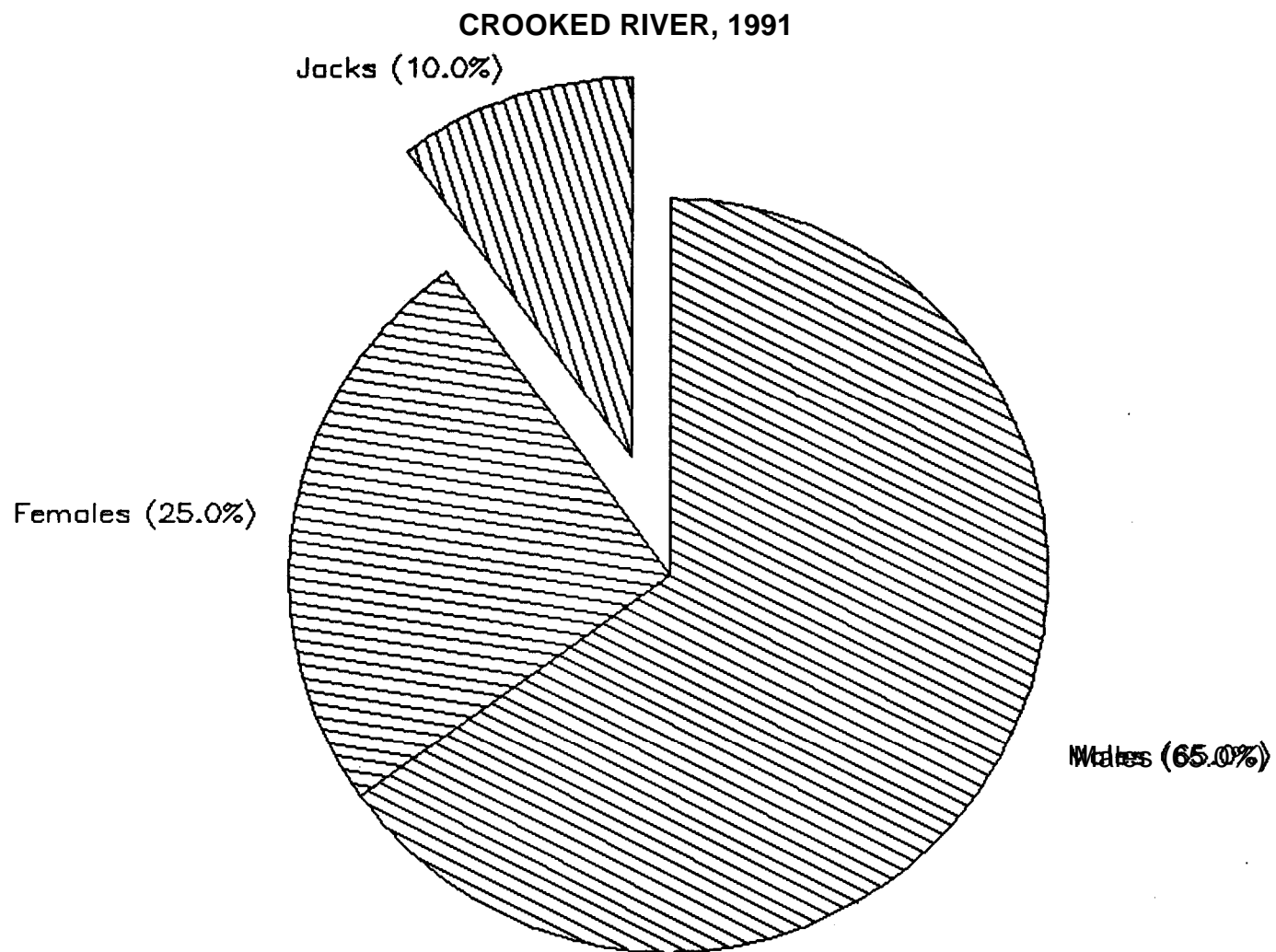
SPAWN DATE	GREEN EGG EST.	EYED EGGS	% EYE-UP	FEMALE
9/20	9,000	7,956	88.4	2

SPRING CHINOOK SALMON RUN COMPOSITION

RED RIVER. 1991 Jacks (5.6%)

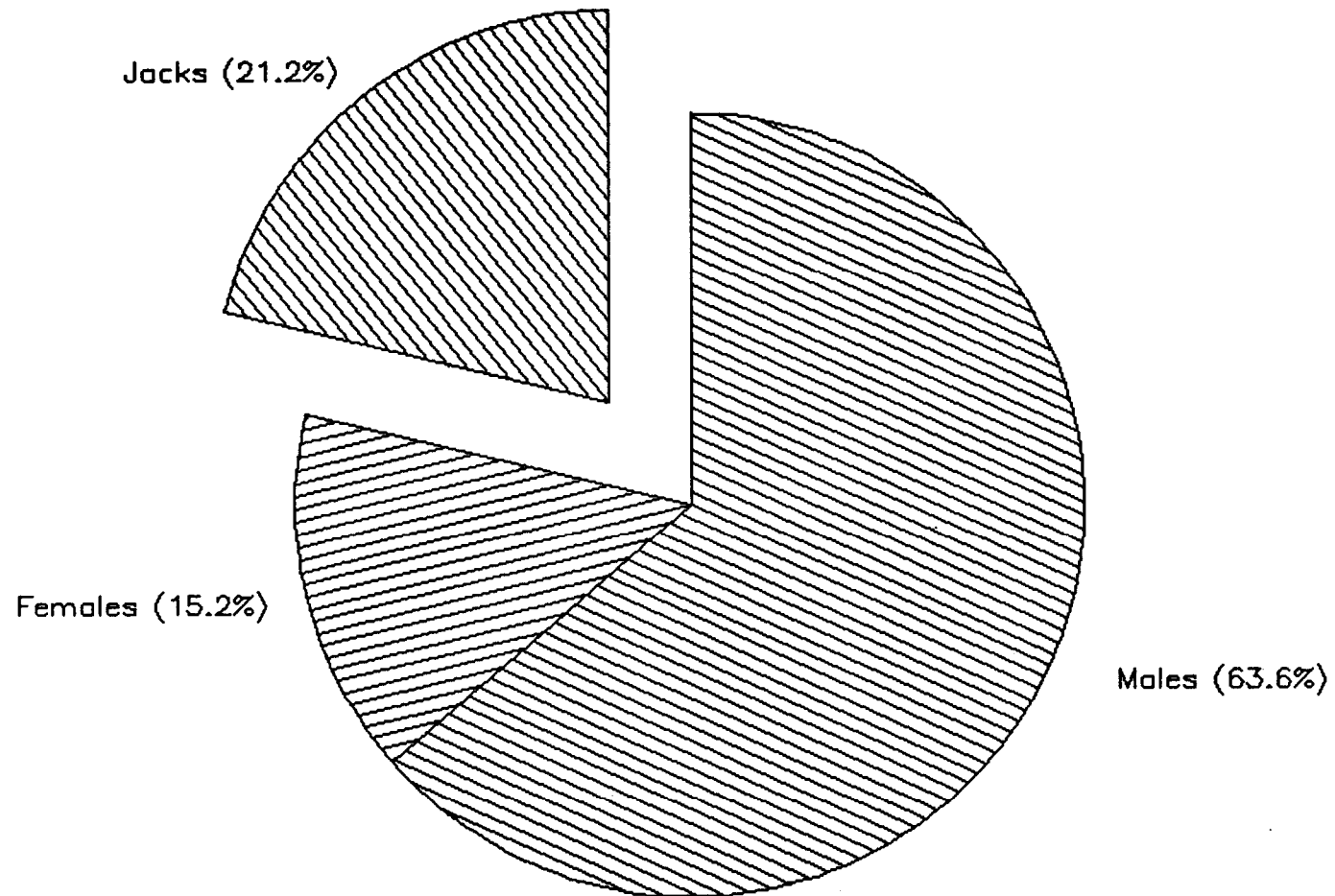


SPRING CHINOOK SALMON RUN COMPOSITION



SPRING CHINOOK SALMON RUN COMPOSITION

POWELL, 1991



Appendix G-1. Summary of spring chinook returns to Red River by brood year.

Brood Year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1982	Fall 1983 Spr 1984	260,000 40,000	2	1985		1986	107	1987	109	0.036%
1983	Spr 1985°	80,000		1986	377	1987	259	1988	636	0.795%
1984	Spr 1986°	136,800	35	1987	132	1988	74	1989	241	0.176%
1985	Fall 1986 Spr 1987	96,400 96,800	3	1988	25	1989	13	1990	41	0.021%
1986	Fall 1987	233,100	5	1989	38	1990	8	1991	51	0.022%
1987	Fall 1988	291,200	2	1990	9	1991	3	1992	14	0.005%
1988	Fall 1989	240,500	1	1991	31	1992		1993	32	0.013%
1989	Fall 1990	273,800	5	1992		1993		1994	5	0.002%
1989	Spr 1991°	63,000								
1989	Spr 1991°	124,000								
1990	Fall 1991	354,700		1993		1994		1995	0	
1990	Spr 1992'	207,500								
1991	Fall 1992	6,000		1994		1995		1996	0	

'Trap was not installed in 1986 due to construction.

°These fish overwintered in the rearing pond.

'These fish were Rapid River stock reared at Sawtooth and released directly into Red River with no acclimation.

°Planted off bridge at ranger station, reared at Dworshak National Fish Hatchery, Clearwater stock.

°Planted off bridge at ranger station, reared at Kooskia, Clearwater stock.

'Acclimated in rearing pond for 21 days, transferred from Dworshak.

Appendix G-2. Summary of spring chinook returns to Crooked River by brood year.

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY % return	from plant
1985		----		1988		1989	4	1990	4	ERR
1986				1989	23	1990	5	1991	28	ERR
1987	Spr 1989°	199,700	2	1990	13	1991	7	1992	22	0.011%
1988			2	1991	208	1992		1993	210	ERR
1989	Fall 1990°	339,087	13	1992		1993		1994	13	0.004%
1990	Fall 1991°	320,400		1993		1994		1995	0	0.000%
1991				1994		1995		1996	0	ERR
199E				1995		1996		1997	0	ERR

°Transferred from Dworshak Hatchery.

°Transferred from Dworshak and Rapid River hatcheries.

Appendix G-3. Summary of spring chinook returns to Powell by brood year.

Brood Year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1984	Spr 1986	--		1987		1988	16	1989	16	ERR
1985	Spr 1987			1988	111	1989	20	1990	131	ERR
1986	Spr 1988 ^a	200,100	27	1989	157	1990	10	1991	194	0.097%
1987	Spr 1989 ^b	200,639	2	1990	16	1991	15	1992	33	0.016%
1988	Fall 1989	314,500	7	1991	249	1992		1993	256	0.081%
1989	Fall 1990 Spr 1991 ^c	307,100 180,764	6	1992		1993		1994	6	0.002%
1990	Fall 1991 Spr 1992 ^d Spr 1992 ^e	358,400 150,800 53,500		1993		1994		1995	0	0.000%
1991	Fall 1992 ^f Fall 1992 ^g	500 7,600		1994		1995		1996	0	0.000%

^aRapid River stock reared at Dworshak.

^bClearwater stock reared at Kooskia and Dworshak.

^cClearwater stock reared at Kooskia; acclimated in rearing pond.

^dAcclimated 21 days in rearing pond before release into Walton Creek, transferred from Dworshak.

^eNot acclimated, transferred to rearing pond and immediately released.

^fThese smolts were released from the rearing pond to Walton Creek.

^gReleased at headwaters of Crooked Fork Creek

Appendix H. Brood year 1991 presmolt distribution.

Destination	Weight	No./lb	No. Released
Red River	380	15.8	6,000
Powell	12	23	500
Crooked Fork Creek	339	23	7,800

Appendix I. Brood year 1991 marking and tagging data.

Release site	Date marked	No. fish marked	Type of mark/code	Purpose	No. marked fish released	Site group release
Red River	5/91	6,054	LV 900 PIT	Management	6,000	6,000
Powell	5/91	500	LV	Management	500	500
Crooked Fork Creek	5/91	7,882	48 PIT, LV	Supplementation	7,800	7,800

Appendix J. Brood year production cost.

BROOD YEAR PRODUCTION COST

REARING TO SMOLT

	<u>Red River</u>	<u>Powell</u>
No. produced	6,000	8,300
Weight	380	348
No. per pound	15.78	23.90
Percent mortality	0.08	0.09
Conversion Rate	1.02	.96

FOOD FED AND
WEIGHT GAINED

	<u>Red River (BY 90)</u>	<u>Powell</u>
Period fed	6/10 - 10/17	6/11 - 9/3
Feed used-lbs	390	336
Wt. gain	380	348
Cost	\$231.10	\$203.28

STOCKING

Date released	10/19	9/05
Number	6,000	8,300
Weight	380	348
No. per pound	15.78	2.90
Operation cost/lb using total budget (less capital outlay)	\$11.31	

COST TO OPERATE ENTIRE PROJECT FOR '90 -91'

Personnel cost	\$370,05
Operation cost	\$410,41
Capital outlay	\$30,580
TOTAL	\$811,04

Appendix K.1. Pathology fish health report.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 92-372

LOCATION: PO

SPECIES: SC

AUTOPSY DATE: 09/06/92

STRAIN: W.0

AGE: JUV

UNIT:

SAMPLE SIZE: 20

REASON FOR AUTOPSY:

INVESTIGATOR(S): DM

REMARKS: FISH APPEARED TO BE SUPERIOR IN QUALITY.

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	24.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRIT	40.40	7.72	1.91
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.70	2.55	3.81

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 20	N 20	N 20	0 20	0 0	B 0	0 20	N 20	A 0	0 1
B1 0	F 0	S 0	1 0	1 0	R 20	1 0	S 0	B 0	1 16
B2 0	C 0	L 0	2 0	2 0	G 0	2 0	M 0	C 20	2 2
E1 0	M 0	S&L 0		3 0	NO 0		G 0	D 0	3 1
E2 0	P 0	I 0		4 20	E 0		U 0	E 0	
H1 0	OOT 0	OT 0	\bar{X} = 0.00		OT 0	\bar{X} = 0.00	OT 0	F 0	
H2 0		O 0		\bar{X} = 4.00				OT 0	\bar{X} = 0.00
M1 0									
M2 0									
OT 0									

SUMMARY OF NORMALS

0 0 0 0 0 0 0 0 0 0

SEX M: 0 F: 0 U: 0

GENERAL REMARKS

FINS: EXCELLENT

GONADS: NO REMARKS

SKIN: EXCELLENT

OTHER:

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 92-438
 SPECIES: SC
 STRAIN: RDR
 UNIT:
 REASON FOR AUTOPSY: INSPECTION
 INVESTIGATOR(S): D. MUNSON
 REMARKS:

LOCATION: RD
 AUTOPSY DATE: 10/14/92
 AGE: JUV
 SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRIT	41.18	2.61	0.06
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	8.76	0.07	0.08

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHES		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	17
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	19	1	3
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	1	2	0
E1	0	M	0	S&L	0			3	0	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0			4	20	E	0			U	0	E	0		
H1	0	OT	0	OT	0	$\bar{X}=0.00$				OT	0	$\bar{X}=0.00$		T	0	F	0		
H2	0			O	0			$\bar{X}=4.00$								OT	0	$\bar{X}=0.15$	
M1	0																		
M2	0																		
OT	0																		

SUMMARY OF NORMALS

100	100	100	100	4	100	100	100	95	100
SEX	M:	0	F:	0	U:	0			

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER:

Appendix L.1. Brood year 1992 steelhead (B) eggs received at Clearwater Fish Hatchery.

Spawning date	Egg take number	Spawning site	Eyed egg delivery date	Number ^a eyed eggs	Temp units	Date hatch	T.U.'s at hatch
4/7/92	11	Dworshak NFH	5/6/92	200,000	395	5/15	641
4/7/92	11	Dworshak NFH	5/8/92	17,750	433	5/15	635
4/14/92	12	Dworshak NFH	5/8/92	129,500	364	5/15	566
4/21/92	13	Dworshak NFH	5/8/92	50,250	380	5/15	582
TOTAL				397,000			

^aMachine enumeration done at Dworshak National Fish Hatchery.

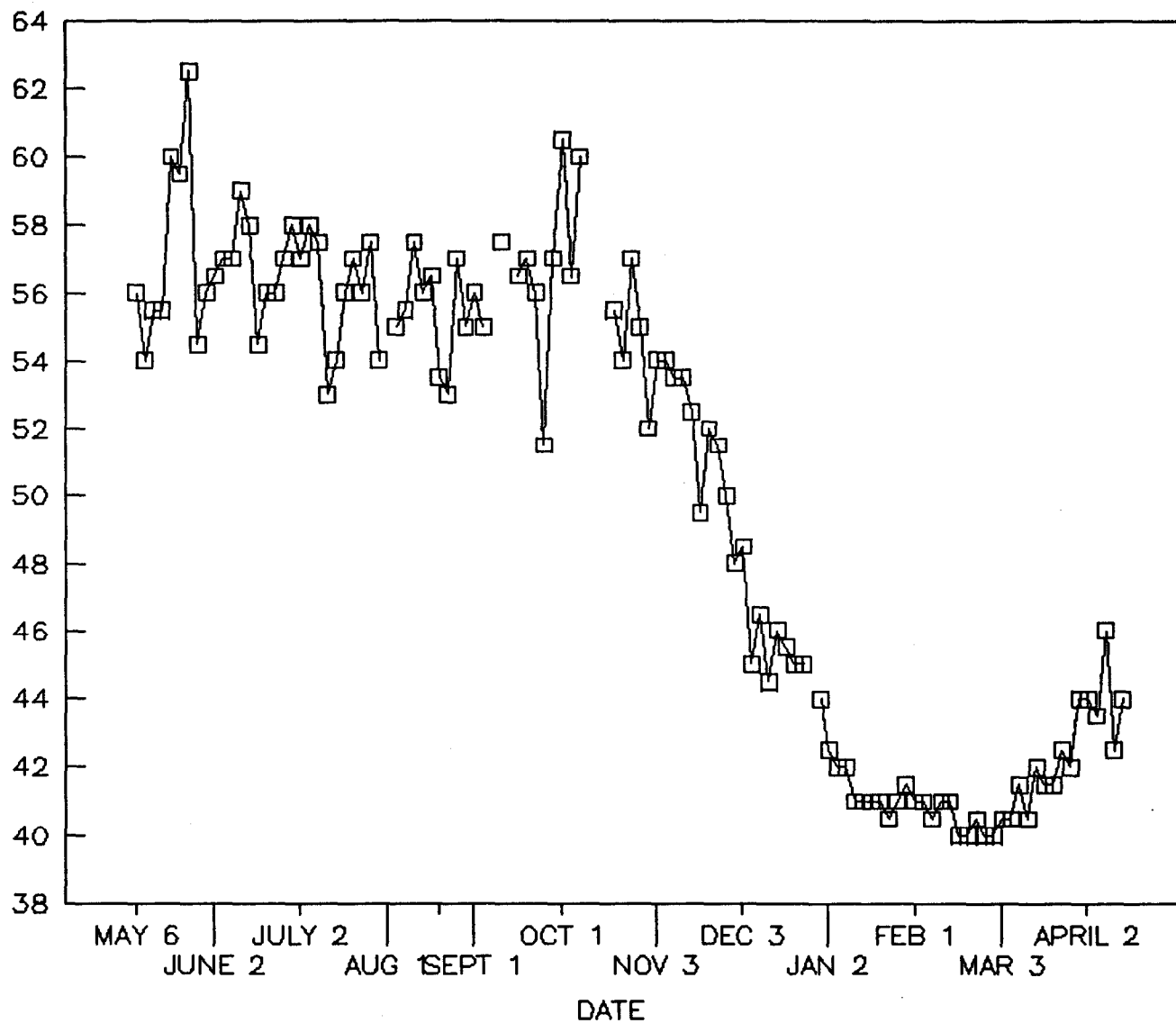
Appendix L.2. Brood year steelhead survival from green eggs to released smolts.

# green eggs	Number eyed eggs	Percent survival	500/lb	Percent survival	Released smolts	Percent survival
Rearing at Dworshak	397,000	99.6	371,688	93.6	*326,300	90.7

*Inventory change during AD marking to 336,160 fish.

CLEARWATER HATCHERY -- BY-92 STEELHEAD

MEAN DAILY WATER TEMPERATURES

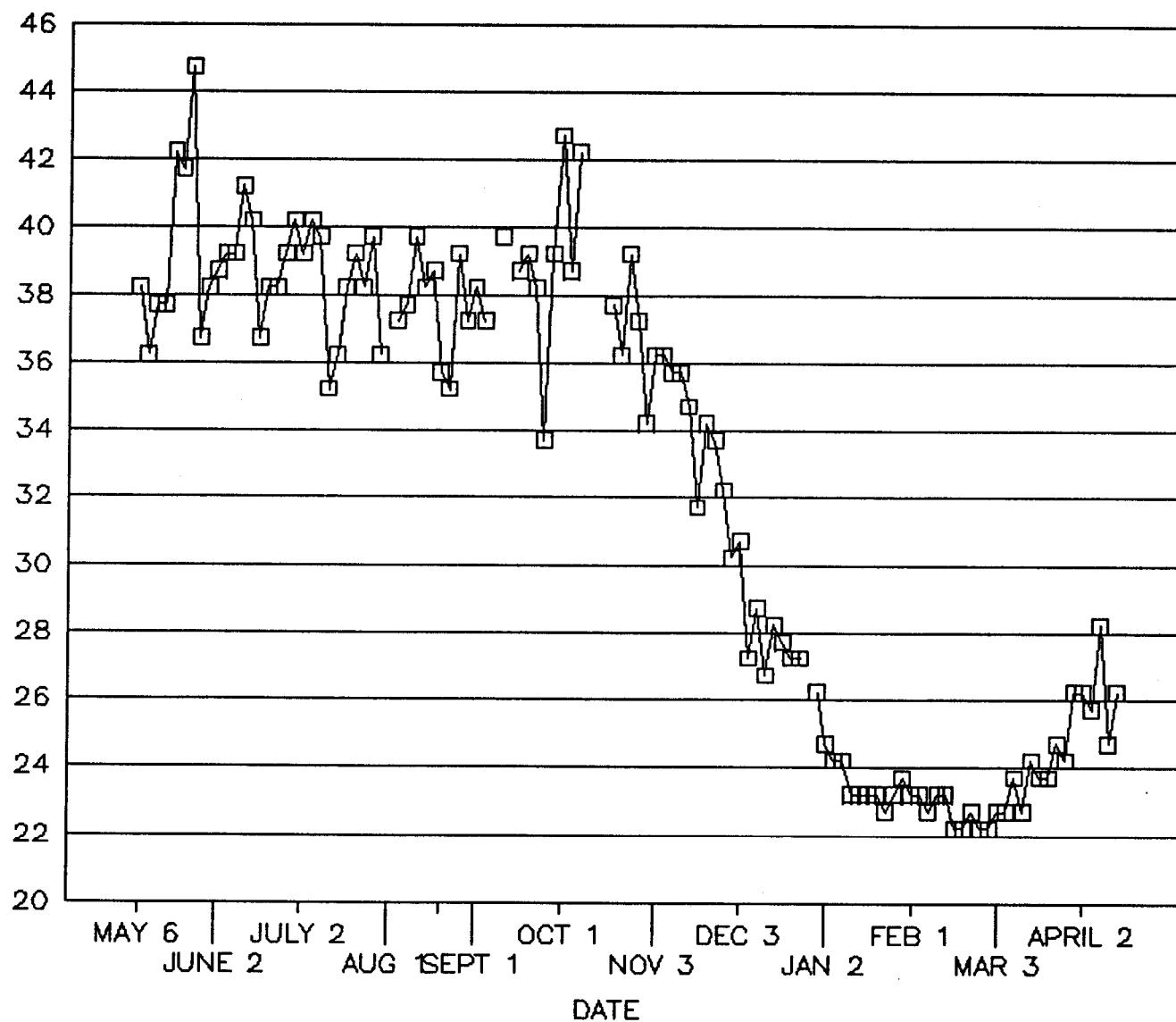


Appendix M.1. Water temperatures, degrees Fahrenheit.

CLEARWATER HATCHERY -- BY-92 STEELHEAD

MEAN DAILY WATER TEMPERATURES

DEGREES CENTIGRADE



Appendix M.2. Water temperatures, degrees Centigrade.

Appendix N. Total mortality of brood year 1992 steelhead, by month,
at Clearwater Hatchery.

Month	Total	Mortalities % ^a
May 1992	30,386 ^b	7.80
Jun	12,828	3.42
Jul	1,256	0.32
Aug	1,418	0.35
Sep	2,138 ^{c*}	0.61
Oct	947 ^c	0.23
Nov	96	0.03
Dec	100	0.03
Jan 1993	140	0.04
Feb	50	0.01
Mar	47	0.01
Apr	220 ^d	0.07
TOTAL	49,626	12.92

^aCalculated from numbers inventoried at ad-marking (September 29 to October 5).

^bIncludes egg pick-off at hatch.

^cIncludes ad-marking losses.

^dIncludes crowding and handling losses when loading fish for stocking.

Appendix O. Brood year production cost.

BROOD YEAR PRODUCTION COST

REARING TO SMOLT

	<u>Steelhead</u>	<u>Rainbow (9/30/92)</u>
No. produced	326,300	257,444
Weight	35,030	17,609
No. per pound	9.31	14.6
Percent mortality	9.4	32
Conversion Rate	1.02	.96

FOOD FED AND
WEIGHT GAINED

	<u>Steelhead</u>	<u>Rainbow</u>
Period fed	4/24/92-4/12/93	3/1/92-9/30/92
Feed used-lbs	64,891	17,551
Wt. gain	34,853	17,459
Cost	\$19,108.34	\$7,784

STOCKING

Date released	4/12-4/14/93
Number	326,300
Weight	35,030
No. per pound	9.31
Operation cost/lb using total budget (less capital outlay)	\$14.62

COST TO OPERATE ENTIRE PROJECT FOR '90 -91'

Personnel cost	\$370,050
Operation cost	\$410,415
Capital outlay	\$30,580
TOTAL	\$811,045

Appendix P. Monthly growth rates of brood year 1992 steelhead (B) at Clearwater Hatchery.

Month	Average end length (mm)	Average wt./1.000 (kal	Conversion rate	Total biomass ^a _____ (k ^g) fibs)		Monthly length increase (mm)	Daily L (mm)
1992							
May	27	0.23	9.26	80	177	1.5	0.188
Jun	43	0.89	1.30	303	668	16	0.516
Jul	65	3.04	0.93	1,034	2,280	22	0.710
Aug	82	6.05	1.56	2,046	4,510	17	0.548
Sep	97	10.13	1.50	3,404	7,504	15	0.500
Oct	115	16.86	1.10	5,652	12,461	18	0.581
Nov	131	24.92	1.45	8,352	18,413	16	0.533
Dec	142	31.61	1.76	10,590	23,346	11	0.355
1993							
Jan	146	33.50	6.00	11,218	24,732	4	0.129
Feb	163	46.10	0.98	15,434	34,027	17 ^c	0.607
Mar	167	50.40	3.47	16,873	37,198	4	0.129
Apr ^b	165	48.69	-1.73 ^c	15,889	35,030	-2 ^c	-0.167
AVERAGES			1.85			11.63	

^a Calculated from the inventory on September 29-October 5.

^b Actual numbers when fish were stocked out (April 12-14).

^c These numbers indicate some sampling error when sample counts are done by different individuals or techniques.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 93-70b
 SPECIES: SB
 STRAIN: DWS
 UNIT:
 REASON FOR AUTOPSY: PRELIB.
 INVESTIGATOR(S): DM/AH
 REMARKS:

LOCATION: CW
 AUTOPSY DATE: 03/10/93
 AGE: JUV
 SAMPLE SIZE: 30

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	166.13	21.90	0.13
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRIT	44.40	3.67	0.08
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.20	0.52	0.08

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 30	N 29	N 30	0 30	0	0 B	0 30	N 30	A 0	0 21
B1 0	F 0	S 0	1 0	1 0	R 30	1 0	S 0	B 30	1 9
B2 0	C 0	L 0	2 0	2 0	G 0	2 0	M 0	C 0	2 0
E1 0	M 0	S&L 0		3 7	NO 0		G 0	D 0	3 0
E2 0	P 0	I 0		4 23	E 0		U 0	E 0	
H1 0	OOT 1	OT 0	\bar{X} = 0.00		OT 0	\bar{X} = 0.00	OOT 0	F 0	
H2 0		O 0		\bar{X} = 3.77				OT 0	\bar{X} = 0.30
M1 0									
M2 0									
OT 0									

SUMMARY OF NORMALS

100	97	100	100	100	100	100	100	100	100
SEX	M: 0	F: 0	U: 0						

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER:

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 93-70a
 SPECIES: SB
 STRAIN: DWS
 UNIT:
 REASON FOR AUTOPSY:
 INVESTIGATOR(S): DM/AH
 REMARKS:

LOCATION: CW
 AUTOPSY DATE: 03/10/93
 AGE: JUV
 SAMPLE SIZE: 29

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	159.07	25.33	0.16
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRIT	46.36	4.12	0.09
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.17	0.49	0.08

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 29	N 29	N 29	0 29	0 0	B 0	0 29	N 29	A 0	0 15
B1 0	F 0	S 0	1 0	1 0	R 29	1 0	S 0	B 29	1 14
B2 0	C 0	L 0	2 0	2 1	G 0	2 0	M 0	C 0	2 0
E1 0	M 0	S&L 0		3 4	NO 0		G 0	D 0	3 0
E2 0	P 0	I 0		4 24	E 0		U 0	E 0	
H1 0	OOT 0	OT 0	\bar{X} = 0.00		OT 0	\bar{X} = 0.00	OT 0	F 0	
H2 0		O 0		\bar{X} = 3.79				OT 0	\bar{X} = 0.48
M1 0									
M2 0									
OT 0									

SUMMARY OF NORMALS

100	100	100	100	100	100	100	100	100	100
SEX	M: 0	F: 0	U: 0						

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER:

Appendix R. Fish marking.

Date marked	Number fish marked	Type of mark/code	Purpose	Number marked fish released	Site group released
9/29-10/5/92	336,160	AD	Hatchery identification	326,300	SF Clearwater River (near Stites)
1/19/93	22,076	LV-CWT #104937	Natural rearing Powell release	*22,076	SF Clearwater River (near Stites)
1/20/93	21,409	LV-CWT #104938	Natural rearing Powell release	*21,409	SF Clearwater River (near Stites)
1/21-1/22/93	25,838	LV-CWT #102947	Natural rearing Powell release	*25,838	SF Clearwater River (near Stites)
1/19-1/22/93	300	PIT, AD	Outmigration Powell release	300	SF Clearwater River (near Stites)
TOTALS	336,160	Ad-clip & AD/LV	Outmigration Powell release	326,300	SF Clearwater River (near Stites)

* All CWT and PIT-tagged fish were AD marked.

Appendix S. Steelhead smolt distribution in the Clearwater River tributaries.

Destination	Release date	Weight	#/lb	# released
SF Clearwater (near Stites)	4/12-4/14/93	35,300	9.3	326,300
TOTAL		35,300	9.3	326,300

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